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FLIGHT

AIRCRAFT, SPACECRAFT, MISSILES

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Corporations at the Clinic

FUTURE historians will find, as a consequence of the printing dispute, an eight-week hiatus between this and the previous issue of *Flight*. As most readers will be aware, this unprecedented break in our continuity has occurred through circumstances beyond our control. But in this restoration issue are recorded the more important events that have occurred since we last appeared.

We have had no hesitation in choosing the subject for comment here. It is the Select Committee's monumental report on B.O.A.C. and B.E.A., reviewed on pages 27 and 28. We agree with the Hon. Member who, opening the all-too-brief (45 minutes) House of Commons debate on this report, described it as "remarkably thorough and penetrating." Even so, it is deficient in three important respects.

First, the report suggests that the Ministry interferes with the Corporations to a degree "far in excess" of the statutes—and it recommends that, when the Minister wants to override their commercial judgment, he should publish a directive. This recommendation is not justified by the Corporations' evidence. Neither complains of Ministry interference. Both, on the contrary, pay tribute (as the report records) to the excellence of existing relations. Could this be so if the Minister were able to threaten to publish overriding directives? The fact that trust and goodwill prevail *despite* the extent of the Minister's unofficial powers is one of those cherished peculiarities of British administration which it would be foolish to destroy. The best governed, certainly in this case, are the least governed.

Britain's Small Voice

Second, the report misses an essential point about the International Air Transport Association—namely, the influence which the U.S. Civil Aeronautics Board exerts upon it, to the benefit of American airlines and their customers. The past rôle of the British Government as a meek rubber-stamper of I.A.T.A. decisions is vividly illuminated by the following exchange: *Chairman*: "And you have no powers over fares, but a fairly good 'say-so'?" *M.T.C.A. witness*: "We have a fairly good 'say-so', yes."

Is it enough for the Government to have only "a fairly good say-so" concerning the deliberations of I.A.T.A.? The report should have asked: Why has Britain no independent repository of national air transport expertise, such as the Americans possess in the C.A.B., capable of evaluating and influencing positively the I.A.T.A. machinations which determine the economic destinies of our airlines?

The report's third shortcoming is directly related to the second. Not one pertinent question was asked about the terms of reference of the body most vitally concerned with the future of British air transport—the Air Transport Advisory Council. Yet that council forms the nucleus of the repository of expertise to which we have referred. The Minister has already hinted that we might give the A.T.A.C. executive powers, and that we might get tougher with I.A.T.A. It is a pity that this otherwise magnificent report—the 445 pages and 48 appendices of which contain something of value to every section of British civil aviation—gives no guidance on these big issues.

FROM ALL QUARTERS

India Buys the Avro 748

PROBABLY the biggest export order ever placed for a British aircraft still on the drawing board was signed in New Delhi in July. Mr. R. P. Sarathy, Additional Secretary to the Indian Defence Ministry, signed an agreement with Sir Roy Dobson, managing director of the Hawker Siddeley Group, to manufacture Avro 748s in India, to replace the Dakota fleet of the Indian Air Force. Manufacture, by Hindustan Aircraft in a new factory at Kanpur (H.Q. I.A.F. Maintenance Command), is expected to call for completion of the first machine by mid-1961, and India is reported to be free to export the aircraft to other Asian countries. An initial number are to be Avro-built. The order was secured against strong competition, including the offer of very favourable terms for twin-Dart aircraft by Lockheed and Fokker. (The latter company, on July 30, secured an order for five Friendships from Indian Airlines Corporation, but this does not rule out the 748 for I.A.C., according to the Indian Minister of Transport.)

A spokesman of the Indian Defence Ministry added that it was hoped also to make an agreement with Rolls-Royce to manufacture Dart engines, though for the first 748s engines would be imported.

Yeovil-Cowes Merger

IN letters to shareholders of Westland Aircraft on July 14 and 31 the chairman, Mr. Eric Mensforth, gave details of his company's acquisition of Saunders-Roe Ltd. and commented: "This merger of two of the most important helicopter companies in the United Kingdom is, I believe, in full accord with the declared policy of Her Majesty's Government for the rationalization and strengthening of the aircraft industry."

Combination of the Yeovil and Cowes firms brings into being the largest helicopter manufacturing unit outside the United States, with current production of six types—Westminster, Whirlwind, Wessex, Widgeon, P.531 and Skeeter. In addition the Isle of Wight company is main contractor for the Black Knight re-entry research vehicle, has built the SR-N1 Hovercraft for the National Research Development Corporation, is engaged on electronic work for missiles and computers, on hydrodynamic research, and on aircraft sub-contracting.

The two principal Saunders-Roe subsidiaries, Saunders-Roe (Anglesey) and Saro Laminated Wood Products, are being acquired by de Havilland Holdings, who have held a minority interest in Saunders-Roe since 1956. Two smaller subsidiaries, Saro Structures and Saro-Nuclear Enterprises, are being retained.

D.H. Holdings and Saunders-Roe announced on July 14 that Mr. Paul Irons would be resigning his executive appointment with Saunders-Roe as from September 1, to take up the full-time post of financial director of de Havilland Aircraft. He has been secretary of Saunders-Roe since 1944 and was appointed a director in 1951. He is being succeeded as secretary by Mr. N. H. P. Tayler, who has been deputy secretary for several years. Mr. A. Stewart Kennedy, financial director of D.H. Holdings and up to now holding a similar position with D.H. Aircraft, is to remain on the latter's Board but will be able to devote more time to the holding company's affairs.

The Hon. H. N. Morgan-Grenville, who has been chairman of Saunders-Roe for 12 years, and Capt. E. D. Clarke, the company's managing director, have accepted invitations to join the Westland Board.

HAIL SMILING MAUGHAN: Winner of the "Daily Mail" Blériot Anniversary Race between Marble Arch, London, and the Arc de Triomphe, Paris, was S/L. Charles Maughan of the R.A.F., who took 40 min 44 sec. Second was Eric Rylands of Skyways with 41 min 41 sec, and third G/C. Norman Ryder (42 min 6 sec). All three used Hunter Two-Seaters between Biggin Hill and Villacoublay. A special prize for originality and ingenuity was won by a B.E.A. syndicate with 62 min 15 sec, using a Comet 4B from Northolt to Le Bourget

SIGNED AND SEALED: Sir Roy Dobson shakes hands with Mr. R. P. Sarathy after signing the Avro 748 order (see first news item). At left are Mr. W. Maiden, Avro assistant works manager, and W/C. W. H. Burbury; towards the right is A.V-M. Jarjinden Singh

The T.188

DURING July it was revealed that the Bristol T.188 "stainless-steel supersonic research aircraft" will be powered by one or more de Havilland Gyron Junior DGJ.10 turbojets. The thrust of the DGJ.10 may also be revealed; without reheat it is 10,000 lb, and in the T.188 reheat to some 2,000 deg K will almost certainly raise this figure by 40 per cent (static).

New Aircraft Marks

PERMISSION has now been granted for reference to be made to three new marks of R.A.F. fighter. The Gloster Javelin FAW.9 is superficially similar to its predecessors, but incorporates minor aerodynamic and electronic modifications and rationalizes other improvements effected in the Mks 7 and 8; like the last-mentioned it is powered by Bristol Siddeley Sapphires with reheat. Two new Hawker Hunter variants are the FGA.9 and FR.10. As the designations imply, these are respectively for ground-attack and fighter-reconnaissance rôles; both are based on the F.6 and are similarly powered by a Rolls-Royce Avon 203.

Remembering Blériot

THE 50th anniversary of the first aeroplane crossing of the English Channel was celebrated in a number of ways during the week-end of July 25-26. There was an air rally at Calais, a ceremony at La Gatte and, on the Sunday, a municipal luncheon in the ancient Maison Dieu at Dover, followed by speeches at the actual point at which Louis Blériot landed on the downs behind Dover Castle.

At the luncheon the speakers were Mr. Harold Watkinson, Minister of Transport and Civil Aviation, and M. Robert Buron, the French Transport Minister.

The memorial, placed at the landing point by the Royal Aero Club in 1910 through the generosity of a member, Mr. Alexander Duckham, is a paved outline of the Blériot monoplane. At the ceremony here, Lord Brabazon (president of the R.Ae.C.), Maj. Jacques Allez (president of the Aéro Club de France) and Mme. Blériot herself all spoke, both in recognition of an "occasion which established that Great Britain was no longer an island" and in memory of the pioneer flight.

Two points which emerged were that Mme. Blériot gave her husband the fullest encouragement in his venture and that (confirming a sometimes-questioned story) a heavy shower cooled the monoplane's faltering engine during the final stages of the flight.

During the ceremony a spectacular tribute was paid by No. 111 Sqn., whose Hunters flew past in formation, then broke into sections to produce what must have been the largest and most accurate smoke letter ever seen—a B for Blériot.

The anniversary was also marked, during the period July 13-23, by the highly successful capital-to-capital race sponsored by the *Daily Mail*. The winner is portrayed on this page and we hope to make further reference to the contest next week.

Parliament and the Industry

IN opening speeches during the aircraft production debate in the House of Commons on July 16 the first speaker for the Opposition, Mr. George Brown, and the Minister of Supply (Mr. Aubrey Jones) ranged over the whole aviation industry field and proferred varied solutions to its difficulties—the Minister stressing combined military and civil orders to widen the potential market.

In particular, he said he was entering into negotiations with Fairey on the possibility of placing a military order for the Rotodyne. This aircraft came into the picture again at the end of the debate when the Minister of Transport and Civil Aviation, Mr. Harold Watkinson, said he hoped B.E.A. would place an order for six in the near future. He added that his Ministry was now working on a programme of landing-places for these aircraft in London.

Mr. Brown, in his opening shots, had suggested a "top-level inquiry" into the aircraft industry and said that "after November"

THIRD DIMENSION of the VC.10 has now been created by a full scale engineering mock-up of the aircraft at Vickers' Weybridge factory. Thirty-five have been ordered by B.O.A.C. for delivery in 1963-64

AT THE RACES: Ron Paine banks his Hawk Speed Six around the Baginton pylon during practice for the King's Cup race, which was won on July 11 by A. J. Spiller in a Proctor 3. Other National Air Race winners included S. F. Jours (Kemsley Trophy), Capt. N. Baldwick (Osram Cup) and D. Hartas (D.H. Trophy) "Flight" photograph

his party would establish one. The Minister of Supply countered by saying that it had become a victim of its own success and was over-large for present and prospective demand. He quoted orders for the Viscount, Britannia, Comet, Vanguard, VC.10 and D.H.121 and said that sales for all of them—except the Viscount—were too small. Contraction of the industry was progressing; Mr. Jones instanced the recent Westland-Saunders-Roe merger.

The Minister also said he was considering where detailed design work could be placed for a supersonic civil aircraft able to fly at twice the speed of sound. He concluded by saying that Government support should not be aimed at "shoring-up" the aircraft industry but reinforcing it at its points of strength.

Preserving Veteran Aircraft

AN Historical Group has been formed by the Royal Aeronautical Society and a register of historic aircraft inaugurated. The Group's aim will be the collection, accurate interpretation and preservation of relevant information and material; it will also co-ordinate and foster the efforts of individuals both inside and outside the Society who, over the years, have undertaken work and research into the history of aeronautics.

The register has been initiated to help to save for posterity the aircraft which it details, listed in two categories—(A) some 120 British and foreign machines of major historic importance, and (B) names and details, where known, of another 67 aircraft—mainly from the inter-war years—of historic interest.

Five years ago the Society acquired the Nash Collection of veteran aircraft to prevent its being sent overseas; and during the past year, in association with the Society of Licensed Aircraft Engineers, an historic aircraft maintenance group has been formed to take care of the Nash Collection.

During recent months the Society has received a number of aircraft parts, engines and equipment of historic interest which are being preserved until a national aeronautical collection can be established. There are financial difficulties in the way of this project; but meanwhile the formation of an historic group and inauguration of a register are steps in the right direction. Further reference to the register will be made in an early issue of *Flight*.

Developments in France

AFTER making its first flight on June 17, during the Paris Salon, the Dassault Mirage IV bomber appeared in the flying display on June 20 and exceeded M=1.9 on its 14th flight. Six Mirage IIIs are now flying, two of them having Cyrano radar, conical camber and slot fences. On June 19 the third Mirage III, flown by Gerard Muselli, raised the 100 km closed-circuit record to 1,785 km/hr (1,109 m.p.h.), reaching a maximum speed of 1,273 m.p.h. during the attempt. The two-seat Mirage IIIB made its maiden flight from Le Bourget after spending the Salon week on the Dassault stand in the exhibition hall. The Communauté test programme continues well and the aircraft has flown from Bordeaux to Melun at 4,000ft at 215 kt on 80 per cent power against 15-20 kt headwinds.

Testing of the Sud SA.3200 Frelon continues after its first flight on June 10. The Turboméca Turmo IIIB engine, three of which power the Frelon, has been type-tested at 812 s.h.p. for take-off and 720 s.h.p. maximum continuous. Sud have received an order for 70 more Sikorsky S-58s to be built under licence at Marignane. The company has also entered an international design competition for a crane helicopter to lift from 8 to 12 long tons. Several proposals have been submitted in conjunction with the Italian company Agusta. German firms are also interested.

Bréguet have prepared a pressurized, 50-seat version of the Intégral having a cylindrical fuselage and lateral access doors. Design of the Type 1150 (Neptune-replacement) is now complete.

The SNECMA C.450 Coléoptère crashed and burnt at Melun-Villaroche on July 25 when control was lost at about 250ft during the transition from vertical to horizontal flight. The pilot, Auguste Morel, ejected successfully.

IN BRIEF

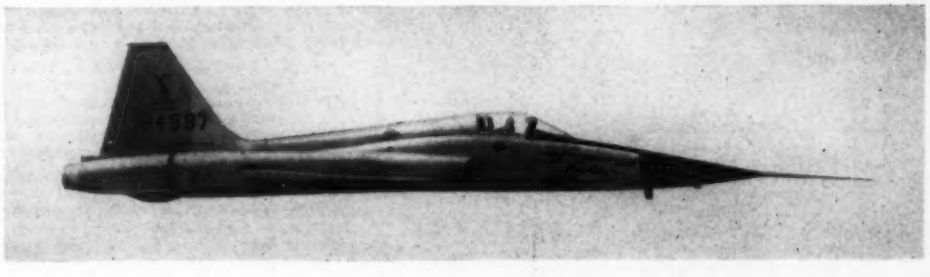
Two new Russian height records have been submitted to the F.A.I. On July 13 V. P. Smirnov flew an "RB" aircraft to a height of 20,300 m (66,601ft) with a load of one metric ton. Next day Maj. V. S. Ilyushin flew a "T-431" to the remarkable height of 28,760 m (94,356ft). Neither type of aircraft has previously been mentioned officially, but the T-431 is said to be a Sukhoi delta.

Air Chief Marshal Sir Claude Pelly has been appointed Member (designate) for Weapons, U.K. Atomic Energy Authority, and will take up his new post later this year. Sir Claude, who is retiring from the R.A.F., has been Controller of Aircraft, M.o.S., since 1956.

A. Cdre. F. R. Banks, until recently a director of the Bristol Aeroplane Co. Ltd. and Bristol Siddeley Engines Ltd., has joined the Board of the Blackburn Group Ltd. He will also become a director of two of the companies within the group, Blackburn Aircraft Ltd. and Blackburn Engines Ltd. Prior to joining Bristol he was with the Associated Ethyl Co. and from 1952 to 1953 was Principal Director of Engine Research and Development (on loan from the company) at the M.o.S.

Owing to "a difference in opinion over matters of policy" Mr. Crawford Gordon resigned as president and general manager of A. V. Roe Canada on July 2. Pending the appointment of a successor his duties are being undertaken by Sir Roy Dobson. Also resigned are J. L. Plant (from the presidency of Avro Aircraft) and F. T. Smye (executive vice-president); Mr. Smye has been succeeded by H. R. Smith.

In the House of Commons on June 17 the Minister of Defence stated of the Saunders-Roe Hovercraft "I am very interested in the project. I am going to look at it very shortly and . . . it is being watched very closely"; of the possible procurement of the American Genie nuclear-tipped air-to-air missile for the R.A.F., "we are considering this proposition but no decision has yet been reached"; and of solid rocket-propellants of high specific impulse, "negotiations are going on between the American firm concerned and the British firm concerned for the further development and production of that fuel here."



FREEDOM FIGHTER: So called is the Norair N-156F (twin G.E. J85) pictured here during its first flight on July 30. Flown by Lew Nelson, Norair's chief engineering test pilot, it exceeded M 1 within 40 minutes of first becoming airborne

EAST MEETS WEST: On August 1 the Soviet Premier, Nikita Khrushchev, inspected the Boeing VC-137 in which Vice - President Nixon flew to Moscow (far left); earlier, on June 28, the giant Tu-114 carried its designer and other Soviet officials to the Soviet exhibition in New York, and is seen here at Idlewild after flying non-stop from Moscow in 11 hours

FROM ALL QUARTERS . . .

The Minister of Defence, Mr. Duncan Sandys, said in the House of Commons on July 8 that the Government had agreed to allow more U.S.A.F. squadrons to be stationed in the U.K. Nine squadrons, chiefly F-100 nuclear attack units, assigned to NATO but which France has declined to accommodate, are being re-deployed in England and Germany.

Sea-level thrusts for four British aircraft rocket engines may now be quoted: the de Havilland Spectre DSpe. 4 and 5 are both rated at 8,000 lb; the Napier Scorpion NSc.1 and Double Scorpion NScD.1 are respectively rated at 2,000 and 4,000 lb.

The June exports figure for the aircraft industry, £15,102,965, brought the total for the first six months of 1959 to a record £87,804,776. This was an increase of 14 per cent over the previous six-monthly record (July-December 1958) and represents an annual figure of £175m, compared with last year's £154m. During June, Switzerland was the leading buyer of British aircraft and parts, spending £1,418,683. Holland's purchases totalled £1,373,453 and India spent £1,270,066.

At an informal ceremony at Luton Airport in June the first Hunting Jet Provost Mk 3s were handed over by the manufacturers to the R.A.F., which will now implement its policy of all-through jet training. The A.O.C-in-C. Flying Training Command, Air Marshal Sir Hugh A. Constantine, took delivery of the first aircraft from Mrs. C. P. M. Hunting and the second was presented by Mrs. L. C. Hunting to A.V-M. Colin Scragg, A.O.C. No. 23 Group. Other aircraft from the first production batch were accepted by A. Cdre. J. N. H. Whitworth, Commandant of the Central Flying School, and G/C. J. H. L. Blount, C.O. of No. 2 F.T.S., Syerston.

Mr. Sean Lemass, Deputy Prime Minister of Eire (now Prime Minister), unveiled a 14ft limestone memorial at Clifden, Co. Galway, on June 15, fortieth anniversary of the landing there of Alcock and Brown on their pioneer non-stop crossing of the North Atlantic in a Vickers Vimy biplane (two Rolls-Royce Eagle). At a luncheon before the ceremony Lord Kindersley, Rolls-Royce chairman, welcomed the guests; and Sir George Edwards, managing director of Vickers-Armstrongs (Aircraft), congratulated Aer Lingus, and Capt. Kelly-Rogers in particular, on the design of the memorial. Irish aviation pioneers present included Col. James Fitzmaurice, Capt. J. P. Saul and Mr. John Maher.

In the early morning of July 25, fiftieth anniversary of Blériot's Channel crossing, the Saunders-Roe SR-N1 Hovercraft made history by skimming from Calais to Dover. Lt-Cdr. Peter Lamb, at the controls, was accompanied by Christopher Cockerell and J. B. Chaplin. The crossing was made at a fuel-conserving speed of 28-30 kt—though 38 kt was attained at one point—and the craft was refuelled (from churns carried on board) before reaching Dover. A chined nose had been added to reduce spray, and a long swell and a mid-Channel popple caused no difficulty. The SR-N1 is soon to be given a propulsion engine, which will increase its speed to 40-50 kt and free the existing engine for lift alone—enough to increase the hover height to about 18in. Studies are in hand for a 40-ton passenger version.

An S.E.5A replica built by R.A.E. apprentices made its first flight, at Farnborough on August 4, in the hands of A. Cdre. A. H. Wheeler.

Mr. P. A. Hufton, formerly Chief Superintendent, R.A.E. Bedford, has been appointed Head of Aerodynamics Department, R.A.E. Farnborough, with effect from July 1. He succeeds Mr. L. F. Nicholson.

The Minister of Supply, Mr. Aubrey Jones, said in a written Parliamentary answer on June 29 that the Britannic prototype should be flying in 1962 and enter service in 1964.

The Fairey Rotodyne transported a 103ft army bridge section three miles from White Waltham to Stanbury Park, near Maidenhead in a demonstration on July 27 for Service and M.o.S. officers. The section, 10ft wide and 7ft high, is believed to be the largest structure ever air-lifted.

TO ALL SUBSCRIBERS

We very much regret that the prolonged dispute in the printing industry has prevented the publication of the issues of *Flight* for June 26, July 3, 10, 17, 24, 31 and August 7.

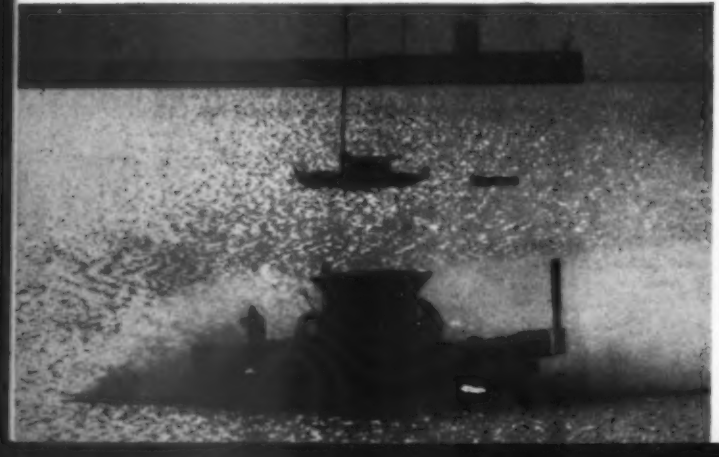
We offer our sincere regrets for this break, in circumstances which were beyond our control. All postal subscriptions will, of course, be extended to compensate for the missing issues.

Brief details were released on June 11 of the Bristol Siddeley BE.53 lift/thrust turbojet. A ducted fan, it has a take-off thrust similar to that of the Olympus, but its exhaust is discharged through variable outlets to give any combination of lift, forward thrust or reverse thrust. Owing to the high by-pass ratio, the s.f.c. is claimed to be better than that of a pure jet, and the thrust/weight ratio is said to be "higher than that of any existing turbojet." The BE.53 could be the powerplant for the Hawker P.1127. Another of the company's range of fan engines is the commercial BE.58, which will be displayed at the forthcoming S.B.A.C. show. Having a cold flow ratio greater than 1.5 the BE.58 gives Olympus-class thrust, for lower weight, consumption and noise.

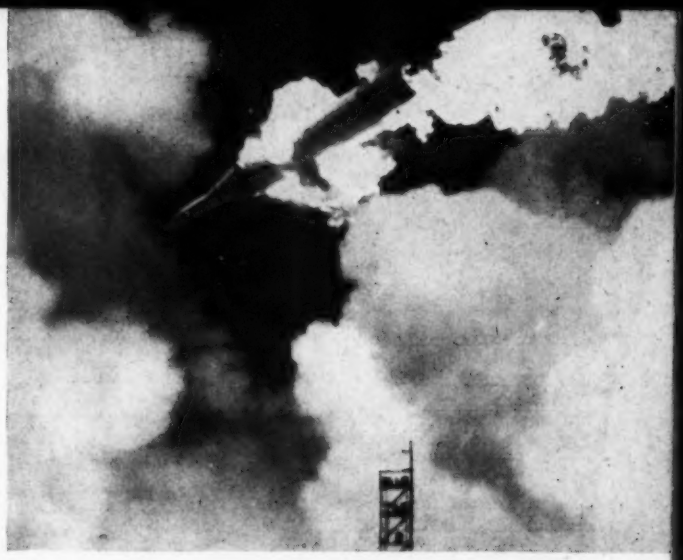
At the annual meeting of Blackburn and General Aircraft Ltd., held at Brough on August 5, the name of the company was changed to The Blackburn Group. In his annual statement to shareholders the chairman, Mr. Eric Turner, said it was not intended to restrict future activities to the NA.39; "two entirely different projects" were being studied. The group's net profit for the year (to March 1, 1959) contracted from the 1957-58 figure of £547,104 to £408,111.

On June 17 Handley Page Ltd. gave a dinner in London to celebrate the 50th anniversary of the company's registration. The Minister of Power, Lord Mills, deputized for the Minister of Transport and Civil Aviation in proposing "The oldest aircraft company," and the Secretary of State for Air, Mr. George Ward, paid his own tribute. Sir Frederick Handley Page responded in characteristic "H.P." style, and the Chief of the Air Staff, Marshal of the Royal Air Force Sir Dermot Boyle, proposed "Pioneers of aviation." Lord Brabazon responded.

We regret to learn of the death, on July 14, of Tony Martindale, chief development engineer of the Motor Car Division of Rolls-Royce Ltd. After five pre-war years with the company he joined the R.A.F., in which he had a distinguished career, particularly as a pilot of high-speed aircraft and captured German machines. After the war he was a Rolls-Royce test pilot for five years before resuming his car-development work.



RIDING ON AIR: As reported at the foot of col. 1, the SR-N1 Hovercraft crossed the Channel from Calais to Dover on the morning of July 25. Here it makes a bluff silhouette against the water of Dover Harbour



Juno II, carrying a NASA Explorer satellite, went out of control immediately after leaving its Cape Canaveral pad on July 16. This dramatic picture was secured just as the destruct button was pressed by the range safety officer

Missiles and Spaceflight

PADDLE-WHEEL SATELLITE

An orbit ranging from an apogee of 26,400 miles to a perigee of 157 miles was achieved by Explorer 6, a NASA satellite launched by a Thor-Able rocket from Cape Canaveral on Friday last, August 7. Designed to study a number of scientific problems, the satellite employs four square vanes carrying 8,000 solar cells used to recharge the chemical batteries which power the radio transmitters. The initial orbital period was 12 hr 45 min and the estimated life-time of the satellite, which weighs 142 lb, is about one year.

The instrumentation of Explorer 6 is intended to obtain radiation information, to relay a crude picture of the earth's cloud cover, to study the earth's magnetic field and cosmic dust, and to evaluate the new system of using solar energy for the batteries. The equipment includes an electronic memory by means of which information is stored, and a control system which permits the satellite's radio transmitters to be switched on by means of a command signal sent from the ground. The first successful demonstration of this control was made shortly after the launch by the Space Technology Laboratories team at Jodrell Bank.

BRITAIN'S SATELLITES

The British space research programme will get under way with the launching of several satellites by means of Scout rockets in about two years' time. This was announced by Lord Hailsham in the House of Lords on July 29. These launchings will reportedly be from Virginia or California, and have been arranged following the visit to the U.S.A. of Prof. H. S. W. Massey and a team of scientists who have held discussions with the National Aeronautics and Space Administration.

The joint Anglo-American satellite programme will run for three or four years and the results are to be made internationally available. Ten scientific teams in the United Kingdom are to be formed to prepare equipment for particular experiments. Expenditure is expected to be between £100,000 and £200,000 per year.

The four-stage Scout solid-fuel rocket is now under development by NASA and is expected to be flight-tested at Wallops Island, Virginia, towards the end of this year. Known as "the poor man's rocket" because of its relatively low cost (about $500,000), Scout is designed to launch a 150-lb satellite into a 300-mile orbit. Chance Vought is prime contractor.

Provision of £55,000 for "upper atmosphere and satellite instrumentation research" was included in revised estimates presented to Parliament on July 6. This was the first allocation for the British space research programme.

DOGS AND A RABBIT

Moscow Radio announced on July 6 that a single-stage rocket had been launched "to a great height" at 3.40 a.m. G.M.T. on July 2, carrying a 2,000 kg payload which included two dogs and a rabbit. As well as the animals, which were said to have been recovered in good condition, a number of scientific instruments were carried. These included equipment for studying the ultra-violet portion of the solar spectrum, structure of the ionosphere, micro-meteorites, and air currents at various heights, and instruments for measuring the density, pressure, temperature, and composition of the atmosphere.

Two dogs, one of them a veteran of the July 2 flight, were carried to an unspecified height in a further single-stage rocket launch on July 10. Information obtained included measurements of the infra-red radiation of the Earth and its atmosphere; photographs of clouds "over a vast area"; a simultaneous analysis of the ion and neutron composition of the atmosphere; and measurement of electrostatic fields. The payload was 2,200 kg and the dogs and instruments were parachuted safely back.

GODDARD SPACE CENTER

The new space projects centre which the National Aeronautics and Space Administration is building at Greenbelt, Maryland, will be named the Goddard Space Flight Center to commemorate the American rocket pioneer Robert A. Goddard. Under the overall guidance of the NASA director of spaceflight development, the centre will perform basic research and will be responsible for the development of satellites, space probes and vehicles, and of tracking, communications and data reduction systems. It will eventually be also a command control centre for NASA spaceflight operations.

The first two major buildings at the centre should be complete in mid-1960 and will house a staff of about 450. Until completion of the centre the remainder of the staff will be housed at the U.S. Naval Research Laboratory in Washington and at the Langley Research Center, Langley Field, Virginia. The director of the Goddard Center will be Harry J. Goett.

An Australian National Committee on space research was formed during June, with Professor L. G. H. Huxley of Adelaide University as chairman. Another member of the Committee is R. W. Boswell, controller of the Weapons Research Establishment at Woomera.

The maximum height of 500 miles was achieved by the third Black Knight rocket test vehicle, launched at Woomera on June 11. Instruments and equipment are said to have worked satisfactorily and the rocket landed 75 miles down range. Black Knight No. 4 flew a successful mission, to an unstated height, on June 29.

Launched from Cape Canaveral on June 22, Vanguard 3, whose 20in satellite was designed to measure the heat of the Sun and of the Earth, did not achieve orbit. The launching vehicle was the same as used in previous Vanguard firings, except that the payload was to be separated from the third stage not automatically, but on ground command at the end of the first orbit.

On July 7 the U.S. Navy permitted publication of a photograph depicting a test firing of the "advanced Terrier" ship-to-air missile. In production by Convair at Pomona, Cal, it retains the original tandem boost motor but has an entirely new aerodynamic configuration. The original Terrier employed fixed tail-fins and a cruciform of moving wings; the latter have now been moved to the tail of the missile, while the wings take the form of four axial strakes along the body.

Originally a U.S. Navy weapon, Bullpup has now been formally adopted by the U.S.A.F. under the designation GAM-83A. Production is proceeding at Martin's Orlando Division on a $6m contract.

Early in June the first Boeing IM-99B Bomarc was fired from Cape Canaveral. Not previously known is the fact that the solid boost motor has a fixed chamber, the jet being deviated by an annular vane. This rocket provides propulsion during the vertical climb until the RJ47-7 ramjets light up at about 8,500ft at M 0.6.

For the first time the nose-cone of an Atlas ICBM was recovered after an "all the way" 5,500 n.m. mission on July 21. This success followed six consecutive failures which led to the suspension of Atlas firings on June 6. Initial operational capability is now expected next month.

On June 23 the first Corporal tactical ballistic missile to be fired in the U.K. was launched by an Army crew (Royal Artillery, R.E.M.E. and R.A.O.C.) from the Outer Hebrides range at Benbecula, South Uist. Corporals have been used as training weapons by No. 47 Guided Missile Regiment since 1956, and this unit and No. 27 both fired rounds at Benbecula during the past two months.

In order to facilitate international production by Belgium, the Netherlands, France, Germany and Italy of the U.S. Army Hawk missile, a new NATO agency, Hawk Production Organization, has been created. It has been unofficially suggested that 22 battalions will be apportioned between the five nations, and that initial deliveries of equipment will begin in June 1961.

Replying to a question by Lord Fraser of Lonsdale in the House of Lords on June 11, the Lord President of the Council, Lord Hailsham, said that communication with possible inhabitants of other worlds was not one of the objects of the British space-research programme. The Government had not sought advice as to whether sentient creatures lived in other worlds, and it would resent any suggestion that the Martians had anything to fear. "Our space programme," he declared, "does not involve any unprovoked aggression against any third world or second world."

Straight and Level

BEFORE I say anything else, I must express my warmest thanks to all those who have sent such kind messages during the dark, Baconless vacuum of the past two months.

Telegrams of loyal encouragement and reassurance have flooded in from all over the world. Here are but a few examples:—

Mr. Hugh Strangeways (Minister of Planes): "It is, I am sure, my earnest and sincere hope that the light which has vanished from the aeronautical scene will soon be rekindled and burning again brightly."

Miss Daphne Dormouse (39-22-36): "I just can't live without you."

Sir John Blackout-Jones (chairman, Super Scruggsdyne Grouponics): "Who'll bring home the 'Bacon' now, eh, laddie?"

Sir Charles Boost (chairman, Plummet Air Lines): "Come and have lunch, I have a super new supersonic airliner brochure to show you."

* * *

I have been most touched by these manifestations of my indispensability, and my chief public relations officer would like to thank the P.R.O.s of all the important and busy people concerned for writing these messages for Straight and Level.

● At least the printing dispute has made it possible for me to catch up with my reading. Or, rather, I now find myself not quite so desperately far behind.

I was half-way through the I.C.A.O. Annual Report (111 pages) when Northwestern University's startling *Prices of Used Commercial Aircraft 1959-1965* arrived on my desk. I was a couple of chapters into this when the masterly Wheatcroft *Report* on the *Cost Structure of the Indian Airlines Corporation* (88 pages) appeared in my tray. I was settling down nicely into this when, all in one week, the following were published: report of the Southall accident investigation; two papers about European air transport read before the Rome Centre for the Advancement of Air Transport by Mr. Bo Bjorkman, and by Dr. Slotemaker of K.L.M.; the Air Registration Board's Annual Report; and the monumental (445 pages) report of the Select Committee into the running of the British Air Corporations.

This little lot (all of it, in my opinion, obligatory reading) arrived on my desk in the space of six days—in addition to my routine reading matter like Flook and Four D. Jones.

● *"The aircraft industry has brought light precision engineering to a very high state. It has had a profound effect on the whole British engineering industry. It is a national asset of transcendent worth, exporting brains, design and craftsmanship."*—Lord Brabazon.

Well said. The influence of British aviation technology on British engineering as a whole is not appreciated enough. The Government should not measure the return on public investment in the aircraft industry in terms of aviation products alone. But it does, I am afraid.

It would pay the aircraft industry to substitute for such broad generalizations a chapter-by-chapter assessment of the *facts* about how it has technically subsidized industry at large—industry-by-industry. I commend this idea to the S.B.A.C.

● I wonder whether you have been as staggered as I at the success-story of the Avro 748? Consider first the facts of British aviation life which the Hawker Siddeley Group's management had to weigh before gambling on the 748.

(1) A new British transport will probably not sell abroad unless it is first adopted at home. (2) Even then it will sell slowly and in small numbers—and probably only after it has proved itself in service. (3) It is pointless to build, two or three years later, an aircraft offering no more than competitors. (4) It counts a lot to have transport-manufacturing experience. (5) Government support for a new civil project can, of course, now be ruled right out.

Now consider the story of the Avro 748. Six months after it was announced the first order—a big one, involving a licence-to-build — came from India (where more than 100 military and civil DC-3s have to be replaced). Not only had the 748 not even flown, let alone been proved, but it was competing for this order with two other comparable twin-Dart transports—one of which was in large-scale production and in regular service with 12 operators, the other of which had been most convincingly demonstrated in India. Transport experience? Avro have 30 Yorks and five Tudors in service. And—the final gasp—the 748 received a Ministry of Supply order.

● "If there is one thing that the B.E.A. staff passenger likes, it is to sit in somebody else's airliner and enjoy minimum landing run and a turn-off to the taxi track at the first possible moment. Such snappy operation makes it immediately clear to him that there is bound to be a lot of resulting maintenance which will make our competitors less competitive. So, as we look out of our imposing edifice at London Airport, we cheer the good smoky braking job for all aeroplanes except our own. Braking an aircraft by the use of wheel brakes is probably the most expensive way of stopping an aircraft, apart from running into a stone wall."—*B. S. Shenstone, chief engineer, B.E.A., writing in "Intercom," B.E.A. flying staff magazine.*

● Elstree Flying Club announced in June a "Learn to Fly Free" scheme. They advertised it in four local newspapers, one national newspaper, and one motoring journal.

So far only one person has taken advantage of the scheme, and there have been only half a dozen other enquiries.

This seems to kill the old argument that expense is the deterrent to private flying. When it is offered free, apparently, there is little or no response. I am at a loss to understand why.

● The prospect of flight-planning hovercraft intrigues me. Imagine, for example:

"Flight-planned cruising height, 5ft 6in. Fuel allowances included for descent to 3ft 6in; holding at that height for 45 min, followed by a descent to 9in; circuit at 2in; and landing . . ."

Will these vehicles be more sensitive to height than jet airliners? Will they step-climb or cruise-climb? And what will be the penalties of having to alter cruising height *en route* because U.S.A.F. hovercraft have blocked off all airspace between, say, 2ft 9in and 7ft 2in?

At least hovercraft will not encounter unexpected 150 kt jetstreams at cruising height, nor are their captains ever likely to misread altimeters by 10,000ft.

ROGER BACON

Well, We Made It

Not So Much Rudder

From a series representing "pilot emotions" in U.S. Air Force Times. The originals—by Chief Blackbear Boson, Kowa-Comanche Indian, civilian graphic arts director at McConnell A.F.B., Kansas—hang in the coffee bar at the B-47 Academy—unquote

R.A.F. Britannia

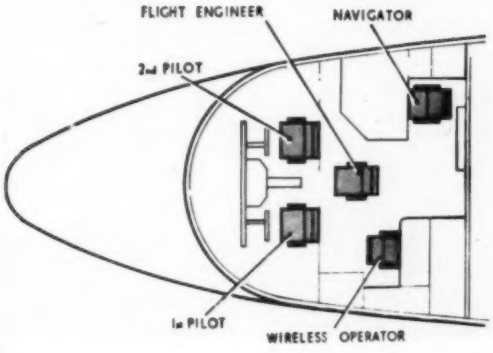
DESIGN FEATURES OF THE TRANSPORT COMMAND MAIN-LINER

ONLY rarely can the Royal Air Force acquire new aircraft in a completely developed form. In fact, the only Command to have achieved this happy situation in recent years is Transport Command, who in the de Havilland Comet 2 and Bristol Britannia have acquired equipment which has been virtually fully developed for them by the manufacturers and commercial operators. As is now well known, the latter aircraft was purchased by the R.A.F. in lieu of the Vickers-Armstrongs V.1000.

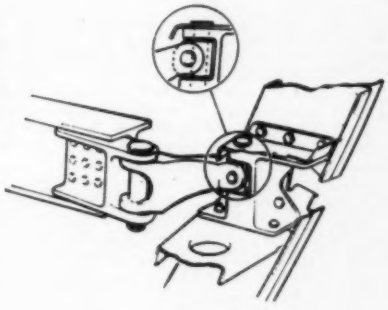
Essentially the R.A.F. Britannias are similar to the 310/320 series of airliners now in use in many parts of the world. They do, however, incorporate certain major modifications which greatly enhance their versatility and value to a military force engaged in the transport of men and materials to "brush-fire" disturbances in out-of-the-way places.

Responsibility for design and manufacture of the Britannia 253—this is the manufacturer's type number—was subcontracted by Bristol to Short Bros. & Harland Ltd., at their main works at Queen's Island, Belfast. Already in production with civil Britannias, Short & Harland found no great difficulty in phasing the military aircraft into the assembly line. Major portions of the 253 airframe are constructed in the same jigs as those employed for the airliner version, and the wings and tail of the two types are practically identical.

One of the most unusual features of the R.A.F. aeroplane is the "floating" floor, in which mechanical linkages are incorporated to accommodate relative movements. Bearing in mind the fact that the single-level floor measures some 80ft×11ft 6in, it will be appreciated that during cruising flight, with the floor warm and the skin subject to below-freezing ambient conditions, a considerable amount of differential expansion might be expected which could lead to severe structural stress. Suspension of a floor beam is depicted in a sketch, and further details of the floor were contained in our issue of August 9, 1957.



Crew stations (left) show marked changes from the commercial transport. On the right is a detail of one of the links which hinge the floor beams to the bulkheads



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The Britannia's freight lift can lift 8,000 lb a height of 11ft 6in in 3 min, and 12,000 lb in a greater time

Another point of departure from the airliner—and that most readily discernible from a superficial inspection—is the incorporation of a large forward door for admitting bulky freight. In the airliner the standard passenger-door size is 70×31in; in contrast the forward freight door of the 253 measures 73×93in, and it can admit a wide range of heavy military loads, including most Service vehicles. It is opened upwards by a self-contained electro-hydraulic system.

In order to facilitate elevation of large indivisible loads to the 11ft 6in-high door sill, and stowage at the appropriate point on the floor, Short's design team have evolved a complete load-handling system tailored to the aircraft. The freight lift takes the form of a platform 14ft×12ft, upon which loads up to 12,000 lb in weight may be raised by an electrically operated cable system. The lift can be dismantled in some ten minutes (the largest portion then weighing under 250 lb) and stowed aboard the aircraft. Normally it would be housed in the forward compartment, being the last item on and first off. Stowed, it measures 19ft×5ft×4ft.

Associated with the lift is a roller conveyor system extending from the start of the lift platform to the rear of the aircraft freight floor. Both internal and external conveyors are supplied in 4ft lengths, each portion being secured to the standard seat rails or platform planking; the section immediately inside the freight door employs ball casters to enable long crates to be angled readily. In general, large pieces of cargo will be mounted on standard pallets to facilitate handling and lashing. Short's pallet measures 8ft×7ft and has a maximum capacity of 5,000 lb. It is constructed from a sandwich of aluminium foil and glasscloth.

In order to meet Air Ministry requirements an entirely new flight deck has been developed. As depicted in an accompanying diagram, the crew positions conform to the latest R.A.F. recommendations; the navigator's station is equipped up to full A.P.970 standard and the flight engineer's station is greatly improved.

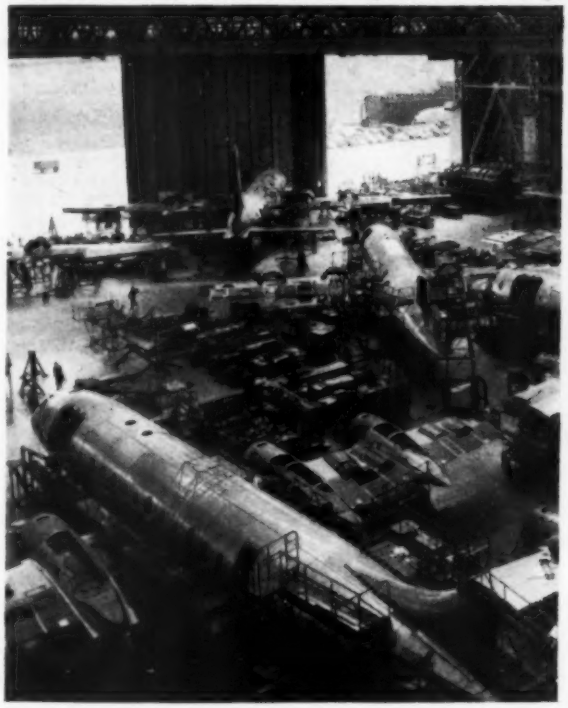
Considerable revision has been undertaken to the cabin-air system. In the airliner fresh air is percolated into the cabin through the porous cloth of the interior trim. In the Britannia 253 the interior is finished in sheets of heavy Fromoplas plastic up to a height of 4ft 6in in order to provide protection against scuffing and impact from sharp cargo. Accordingly, special perforated ducts are incorporated to feed the fresh air, together with risers of a new pattern.

Standard seat in the 253 is a new 9g triple or double unit of Short's own design. The two standard all-passenger configurations seat 110 and 115 passengers, at a pitch of 36in. When not in use all the seats may be folded and stowed beneath the floor of the aircraft. In the ambulance rôle the aircraft can accommodate a total of 53 stretcher cases, together with seats for six attendants. Portable oxygen and iron lung equipment may be carried, and all these items, together with the stretcher posts, may be similarly stowed in the underfloor freight holds.

Minor alterations have been effected to improve the efficiency of the powerplants. The engine is the Proteus 255. This is essentially a military version of the Proteus 765, and has a similar power rating. Compared with the engines in airline service the chief differences are the incorporation of "rabbit warren" intakes, water injection to offset loss of power at hot or high airfields, and the universal employment of de Havilland propellers with solid Duralumin blades.

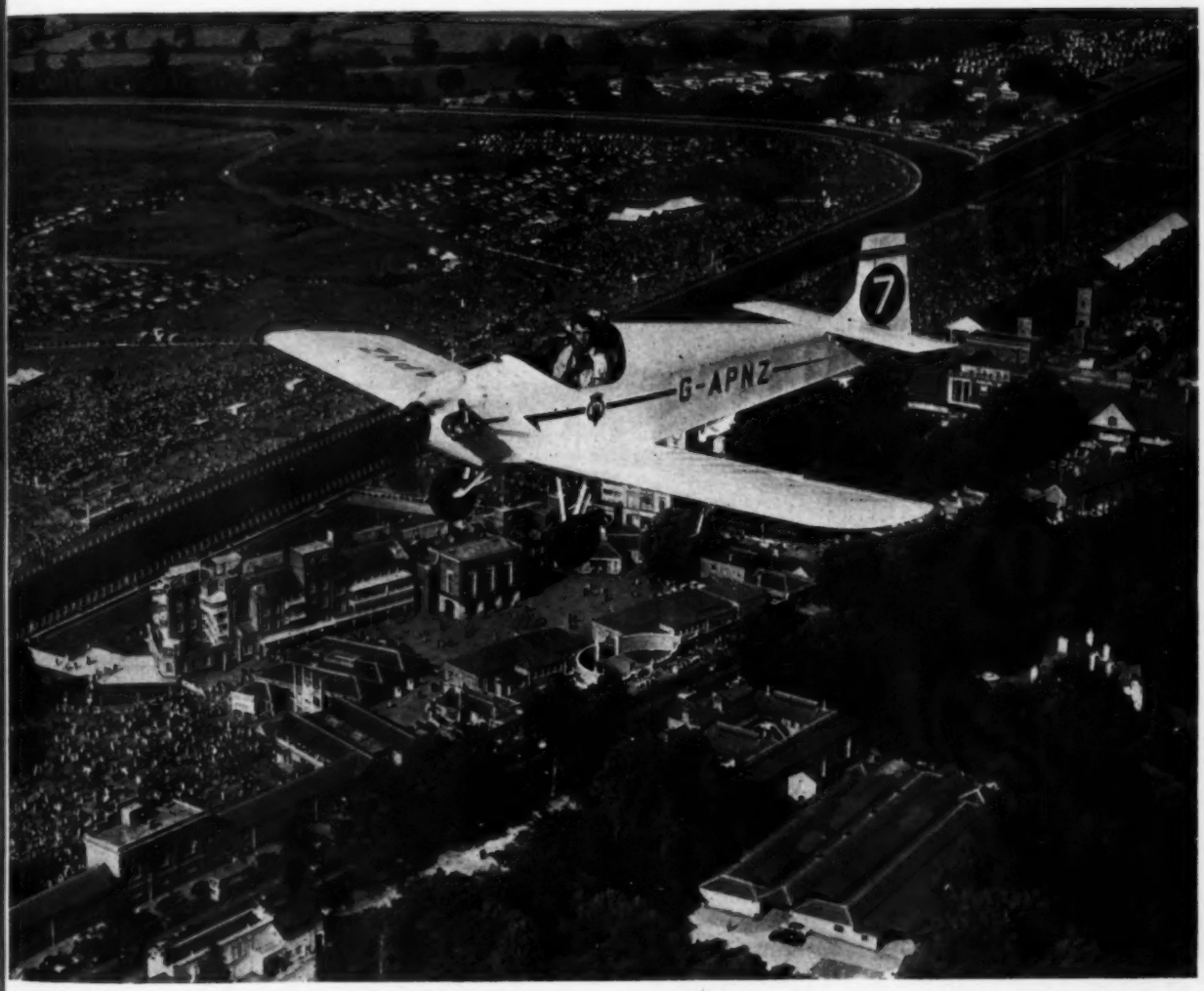
Total procurement of the 253 amounts to twenty aircraft. The first, bearing the serial number XL635, flew for the first time on December 29. Several 253s have now flown and the machine is well advanced in its trials, both at Queen's Island and Boscombe Down. The first unit to employ the Britannia is No. 99 Sqn, based at Lyneham, Wilts. When fully equipped its ability to conduct heavy trucking activities on a global scale will be unrivalled in the Western world by any other squadron outside the legendary MATS.

On the production line at Queen's Island the R.A.F. machines are rendered obvious by the cavernous freight opening in the forward fuselage



ROYAL TURBULENT

Among the six Rollason Turbulents which competed in this year's National Air Races was the Tiger Club's G-APNZ, entered by the Duke of Edinburgh and flown by his equerry, S/L. John Severne. These "Flight" photographs show S/L. Severne in the cockpit, about to taxi out for the first time at Croydon, and piloting the aircraft over Ascot



Noise in the Jet Age

By H. R. BROADBENT

PEOPLE around London Airport are primarily troubled by noise from aircraft: aircraft taking-off, landing and testing. There is an undercurrent of fear of one crashing on their houses, particularly on the line of the runways and under the regular flight-paths; but most people protect themselves with the cloak of "it won't happen to us" and push fear, for themselves and their children, into the background.

The primary nuisance is noise. It interrupts thought, conversation and wireless. It wakes people up and keeps them awake. It does no good. Protests have been made in varying degrees, initially by those close to the airport; but gradually, with more power in aircraft and greater noise, people further and further away have added to the clamour for noise reduction on the ground and in the air. Now, with the advent of the jets, this unwilling audience has grown enormously.

There is, however, a secondary source of irritation which colours the whole background of the approach to the primary nuisance and may indeed be responsible for wrong thinking in the Ministry of Transport and Civil Aviation. Local residents, when they make their protests to the Ministry, are never satisfied that the answers are complete. There appears to be a missing factor. One of the residents' associations refused to take part in a B.B.C. discussion on the subject because, they said, answers not given in free discussion were "frequently ambiguous and sometimes misleading."

The association concerned has had many years' experience in dealing with the Ministry; and, whilst to the inexperienced their remarks may seem to be unduly antagonistic, it cannot be said that the results of official propaganda and the effect of the measures taken have been successful.

The Minister and his officials, on their part, find themselves in the main the foster-parents of a bawling child which they cannot control. The original plans for the layout of the runways and the maintenance area were made on maps with a complete blank outside the airport. In consequence, there is a runway directly in line with an established housing estate only 2,400ft from the threshold and a maintenance area less than 2,000ft from a well built-up area. The Ministry has been committed to a programme of expansion which has led to a conflict between its official commitments and its personal desires to avoid being a nuisance. Aviation and its attendant industries, magnified enormously during the war, carried into peacetime an aura of romance which has since been well exploited by the advertisements for air travel. To the operators of aircraft and to the providers of airports, there could be no other than a common incentive to ensure that air transport should grow and that London Airport should become a main centre in the web.

Financial commitments, with an annual deficit of over £5,000,000 on the airports of Britain, added pressure to this desire. It has been no wonder that protests from local residents were staved off with politenesses and work on noise reduction relegated to a low priority. In addition, since air transport is international, the Ministry has been faced in the past not only with protests about noise from people local to London Airport, but also with a contrary heavy volume of reaction from change, both in public and in private, from the air centres of the world. Local residents are told, in consequence, that if conditions are made too onerous the traffic will go elsewhere and London Airport will sink in importance.

Further, the aircraft industry, with its military research and building programmes cut by the growth of the long-range missiles, pushes for greater subsidies to research into the development of civil aircraft. Larger and more expensive aircraft have been and are to be built with greater power and, it is said, greater noise.

With all this as a background the Minister finds himself faced now with a larger and larger audience for the aircraft he allows to operate. It should be clear that it is the Minister who permits the noise to be made. Parliament, twelve years ago, after a debate which showed its doubts about the wisdom of the Clause, licensed air operators through the Air Navigation Act (1947) to make as much noise as they liked so long as it was produced within the limits of the Air Navigation Order and Air Navigation (General) Regulations obtaining at the time. Fundamentally, therefore, people around the airports have no legal standing for their protests. Action for nuisance has been barred, and the goodwill of the Minister and his officials and the operating companies, urged by public opinion through the Press and Members of Parliament with constituencies adjoining airports, has been practically the only source of effort in noise reduction. Sound insulation can deal sufficiently with the silencing in passenger and crew cabins, so there is little incentive from that angle.

It cannot be said that the protests have been unavailing. The statement of Sir Miles Thomas, a former chairman of B.O.A.C., is evidence. He said: "We aircraft operators could well consider injecting a new factor into our forward aircraft specifications and refuse to buy machines which do not conform to strict noise limitation." But his advice may not be followed, and the suspicion of residents around the airport that research and the application of research to aircraft noise are well down in the programme of work on aircraft and at London Airport remains.

The attitude of playing down the effects of noise is understandable, but it is one which, in the opinion of a growing number of people, must change. Under present legislation, however, it would seem to be difficult to bring greater pressure to bear, except by the use of the one safeguarding sentence in the Air Navigation Regulations which reads as follows:—

> *"Regulation 230*
> . . . the conditions under which noise and vibration may be caused by aircraft (including military aircraft) on Government aerodromes, . . . shall be as follows . . .
> (a) . . .
> (b) . . .
> (c) (i), (ii) & (iii) . . .
> and such special conditions, if any, as may be prescribed as respect any such aerodrome as aforesaid."

The vagueness of this sub-section appears to be its own advantage, but in defining such conditions the Minister faces a further difficulty—one which has haunted every discussion and led to more than one misunderstanding—in the *assessment* of the noise from aircraft.

Noise is subjective. It is by British Standards definition "sound undesired by the recipient," and by American definition "unwanted sound." In argument, therefore, there is a perpetual reference to personal reactions in which local residents who are disturbed are very clear in their opinion on the sound coming from the aircraft, whereas people in the Ministry, and the operators (whose bread and butter comes from the source of the sound) do not find it so unwelcome.

There is no difficulty in making an objective scientific appraisal of sound. It can be split up into its various frequencies or frequency bands, be measured in terms of sound-pressure levels above a reference magnitude and be read on an instrument. The unit of sound pressure level is the decibel (*db*), which is a logarithmic function related to other levels by the equation

$$n = 20 \log_{10} \frac{p_1}{p_2}$$

where the sound pressure level is in decibels and p_1 and p_2 are sound pressures in dynes/sq cm (microbars).

The reference magnitude for stating sound pressure levels in air is 0.0002 dynes/ sq cm.

The comparison between two sound-pressures can be made without resorting to the reference magnitude. If p_r is the reference sound-pressure and p_1 and p_2 two other sound-pressures, the two sound-pressure levels (s.p.l.) n_1 and n_2 are:—

$$n_1 = 20 \log_{10} \frac{p_1}{p_r}$$

$$n_2 = 20 \log_{10} \frac{p_2}{p_r}$$

$$\left.\begin{aligned} p_1/p_2 = \frac{p_1}{p_r} &= 10^{n_1/20} \\ \frac{p_2}{p_r} &= 10^{n_2/20} \end{aligned}\right\} \frac{p_1}{p_2} = 10^{(n_1 - n_2)/20}$$

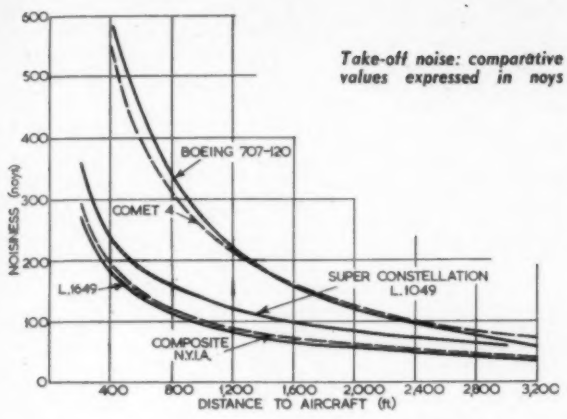
If there are, therefore, two sound-pressure levels of, say, 100*db* and 94*db*, the ratio of sound pressures

$$\frac{p_1}{p_2} = 10^{(100-94)/20} = 10^{0.3} = 2.0$$

A difference of 6*db* in sound-pressure levels means that the sound pressure is double.

Figures of sound as sound-pressure levels are, however, useless to the layman. He may well be told that two sounds which he knows have a different effect on his senses and nerves, one being more unpleasant than the other, have the same sound pressure. He feels he is being misled and distrusts further information from the same source. Sound pressure-levels in isolation are of no use in discussion on noise.

It was not long before the difference between objective measurement of sound as sound pressure and subjective reaction to the sounds became obviously necessary. The stage was reached when the loudness of a sound as measured by the human ear was introduced into the acoustic vocabulary and tests to compare sounds of equal loudness were made with the human ear as the comparing instrument.



Notes: (1) The distance to the aircraft is measured in each case from an observer on the ground directly beneath the flight-path. (2) The noisiness values in noys are directly comparable; thus, at a distance of 1,200 ft. the noisiness of the Boeing 707-120 and the "composite N.Y.I.A." (a mean propeller-driven aircraft at New York International Airport) are respectively 223 and 90, i.e., the Boeing at this distance on full power is two-and-a-half times as noisy as the composite aircraft. (3) References: Reports (October 1958) by Bolt, Beranek and Newman to the Port of New York Authority; *Flight* for November 7, 1958; British Standard 3045 : 1958

NOISE IN THE JET AGE . . .

The experiments carried out by more than one team led to the definitions of "loudness" as an observer's auditory impression of the strength of a sound and of the "sone" as the unit of loudness on a scale designed to give scale numbers proportional to loudness. The numerical value of one sone was assigned to the loudness of a sound judged by normal observers to be equal in loudness to a pure tone of frequency 1,000 cycles per second with a sound pressure level, instrument-measured, of 40*db* above the standard reference pressure of 0.0002 dynes/sq cm.

A further dimensionless unit, the phon, was invented to connect the sone to sound pressure-levels.

The loudness level, in phons, is related to the degree of loudness by the equation

$$S = 2^{(P-40)/10}$$

where S = sones and P = phons.

It will be noted that where $P=40$, $S=1$ and an increase of 10 phons doubles the lower value of loudness in sones .

It should further be noted that, as sone numbers are proportional to loudness, if one sound has a loudness of 64 sones and another of 128 sones, the second sound is twice as loud as the first.

Sounds are generally composite (i.e., are made up of various frequencies), and the loudness of sounds at the various frequencies is different for the same sound pressure-level. For instance, from Fletcher-Munson curves of loudness levels, with the same sound pressure level of 100*db*, the loudness in sones at 100 c/s is of the order of 64 sones whereas at 4,000 c/s it is about 119 sones, approaching double loudness. This is an example of the futility of quoting sound-pressure levels as a means of comparison between the loudness of sounds.

Even though the development of a method of producing subjective units of sound loudness was a great advance, and even though it has become possible by measuring sound pressure-levels at the various frequencies which generally constitute an overall sound and from them derive an overall comparable figure of loudness, even so there has still been something lacking. "Noise" is the missing factor. We have had "sound" measured as a pressure level, and we have had "loudness" of a sound, a subjective human-ear appreciation of comparable sounds at various frequency. But "noise"—unwanted sound, sound undesired by the recipient—has not up until recently been assessed scientifically.

It has been left to the Port of New York Authority—deeply concerned, as *Flight* has mentioned, at the possibility that action would be taken in the courts by local residents to shut down the International Airport because of noise—to institute tests on the new jets, the Boeing 707-120 and the Comet 4, with a view to regulating the conditions under which they could operate. The firm of acoustic consultants who undertook the task of making the tests, Bolt, Beranek and Newman Inc., faced with a position in which the *annoyance* caused by aircraft was to be the criterion, decided that basic data were required. They made a very full series of observations of people's reactions to the "noisiness" as distinct from the "loudness" of the sounds from an aircraft.

The question asked of the observer was not, as previously, to match a sound to an equal in loudness, but to adjust the intensity of the comparison sound until he or she found them to be equally annoying; and "equally annoying" was to be interpreted in this way: that the subject, the observer, would under ordinary conditions of daily life find the comparison sound (as adjusted) to be no more and no less annoying (or acceptable) than the presence of the standard noise (as given).

The results were startling. Mention has already been made of the fact that the "loudness" of a sound at 4,000 c/s and a sound pressure-level of 100*db* is nearly twice that of a sound at 100 c/s and the same pressure-level. When the same comparison is made on the basis of annoyance the units of noisiness are 42 for the frequency band, 75-150 c/s at 100*db* sound pressure-level and 135 for the frequency band 2,400-4,800 c/s at the same sound pressure-level. The noisiness of the higher frequency sound is 3.2 times that of the lower frequency sound. Sound pressure levels show themselves to be even more misleading when noise is discussed than when loudness is considered.

The unit of noisiness has been termed the "noy" and a numerical value of 1 noy has been assigned to the perceived noise in the octave band from 600-1,200 c/s of random noise at a sound pressure-level of 40*db* above 0.0002 dynes/sq cm.

The perceived noise level (*PNdb*) is related to the noisiness of a sound by an equation given in the report in the form

$$\frac{1.2+\log_{10} N}{0.03}$$

with $PNdb$ = perceived noise level and N = noys.

This is an approximation to the form of equation relating phons and sones already mentioned and can more accurately be given as

$$N = 2^{(PNdb-40)/10}$$

Professor Stevens of the Psycho-Acoustic Laboratory at Harwood University developed a method of calculating the total loudness of a sound from its loudness in each frequency band. This method has been applied by the consultants to the results they obtained from their subjective tests.

Given, therefore, the sound pressure-levels of an aircraft, as measured by instrument at any recording station for each band of frequency within ranges spreading from 20-75 to 4,800-10,000 c/s, it is possible to calculate that such an aircraft is at that location making a noise of so many units of noisiness. If the spectrum of sound from a second aircraft at equal distance is also measured and a figure of noisiness derived, the two figures can be directly compared.

For instance, *Flight* in its issue of November 7, 1958, published a summary table of the perceived noise levels of the Boeing 707-120, Comet 4 and a composite propeller-driven aircraft, all on full power, at various distances from an observer and under equal conditions of wind, temperature and pressure. At a distance of 1,000ft the three comparable outdoor figures of perceived noise levels for Boeing, Comet and a composite propeller-driven aircraft are 121, 120 and 107. From the formula

$$N = 2^{(PNdb-40)/10}$$

it will be seen that the noisiness figures of the three were 274, 256 and 104. In other words, the noisiness of the two jets is about 2½ times that of the composite propeller-driven aircraft. Even at 2,000ft where the more objectionable higher frequencies would be reduced in their potency, the three figures of PNL were 109, 110 and 100, giving noisiness figures of 119, 128 and 64. The jets make double the noise at this distance. (See accompanying illustration.)

The problem is stated. People around London Airport are troubled by noise. How much noise? What does the Minister mean when he says that the Boeing 707 and Comet 4 will operate into London Airport "under conditions which are designed to cause no more noise disturbance than the heavy piston-engined aircraft currently in use, when passing over the main built-up areas in the neighbourhood"? Does he mean "noise" as defined for the Port of New York Authority? At what height are the piston-engined aircraft passing when the jets are, as the Minister guarantees, "at a height of not less than 1,000ft over the nearest built-up area along the flight-path" when taking off?

How much noise is coming from the Tu-104 and the Caravelle? What steps are being taken to reduce noise? Has a level of noise at the airport perimeter, defined in units of noisiness, been determined for the future, or are people to suffer from an ever-increasing bombardment from noise in the hope that their dulled senses will cause them to submit?

If there are to be clear and unambiguous statements on noise and the present difficulty in interpretation be overcome, a unit of noisiness must be quoted in future which satisfies scientific requirements and the people affected.

Shall we start to talk about "noys"?

Aeronautical Bookshelf

The Tale of the Comet, by Derek D. Dempster. Allan Wingate (Publishers) Ltd., 12 Beauchamp Place, London, S.W.3. Price 21s. Illustrated.

THE story of the Comet will probably be told as long as men fly, and as long as they enjoy a good tale. There can be few true stories so full of such emotional ingredients—the dream, the vision, the challenge to conquer new technological peaks. The Comet was born of all these things. It became a national triumph, the symbol of a great progressive nation. And then the triumph was cruelly transformed into tragedy—a tragedy that tested the character of the nation, and proved that it was not lacking. The story alone of what happened after those disasters seven miles high over the Mediterranean, the subsequent salvage operations and the work of technical detection, must rank as one of the most outstanding of our time.

The story of the Comet has never been told as it deserves to be told: indeed, there has really been only one book on the subject, *The Comet Riddle*, by Timothy Hewatt and W. A. Waterton, and that was disappointingly superficial. In *The Tale of the Comet* Mr. Dempster aims at filling the gap in the chronicles of technical progress; but he has only narrowed it. Those who look for new and deeper insight will be disappointed, for the book is mainly a rewrite of material already published. But it is still quite fascinating to relive those five-year-old emotions, and it is satisfying to find that the author has taken care to maintain a high standard (with only minor lapses) of accuracy.

It is a pity that this merit is obscured by the literary style, which especially in the earlier passages is unnecessarily over-dramatized and strident. For example:—

"Captain Johnson [commander of the B.O.A.C. Argonaut which took off from Rome just before Comet 1 G-ALYP] handed over to his First Officer and went back to the passenger cabin. He looked pale and worried as he took the empty seat next to Noel Monks—the seat Chester Wilmot would have had.

"He paused for a few seconds and then in a blurted whisper said: 'I'm afraid your pal Wilmot has had it. The Comet has gone in. It is not answering our calls. Don't tell anyone!

"Monks, a burly, pink-faced and quietly gregarious individual, paled, and for the next three hours sat glumly nursing his terrible secret."

The Comet story does not deserve this sort of treatment.

J. M. R.

Sputniks and After, by Karl Gilzin. MacDonald & Co. (Publishers) Ltd., 16 Maddox Street, London, W.1. Price 21s. Illustrated.

TO an account of Russian space-travel work to date are added some shrewdly imagined glimpses into the future. The translation from the Russian retains some of those superlatives which we have come to expect—and to ignore—in propaganda.

But the body of the book is good, with some revealing illustrations and accounts of Russian achievements, plus a simply written introduction to the space around us. The author does not pretend that safe space-travel is yet possible, and he paints a lively picture of the problems still to be overcome. Of the meteorite hazard he says that some of these objects are mere specks of dust while others are "tremendous fragments of celestial bodies, entire mountains rushing about in space and usually surrounded by a suite of smaller bodies." Yes, there are certainly some problems to be faced.

A. C. B.

High Temperature Effects in Aircraft Structures, edited by Professor N. J. Hoff. Pergamon Press Ltd., 4 Fitzroy Square, London, W.1. Price 70s. Illustrated.

ONE original object of this publication was to acquaint European scientists and engineers with aspects of high-temperature effects on structures by reviewing them in turn. In fact, of the sixteen chapters, nine are of American origin, with most authors writing reasonably within their previous experience. This change has no doubt enhanced the value of the work, providing the reader has the mathematical background required.

Professor Hoff, as editor, mentions the White Paper of 1957. Its effects are apparent in the relatively small British contribution to the subsequent review of Western high-speed aircraft and missiles.

While any high-speed vehicle is only as good as it materials, and the importance of understanding basic phenomena cannot be denied, the specialized chemistry in the non-metallic material sections is unexpected in a general review. Turning to activation energy, the greater applicability of this concept to polymers will be envied by the structural engineer, who cannot usually apply it in a working temperature range.

The treatment of creep includes mechanical analogues, column buckling and redundant structures. Although the examples are simple in comparison with aircraft, they enable principles to be illustrated. The section on high-temperature fatigue is noteworthy for its interesting diagrams and discussion of material damping.

Physics are in evidence in the discussion of external sources of heat up to free-molecule conditions, while heat transmission through the structure is treated in an engineering manner. The section on numerical methods, with Schmidt's plot in evidence, is welcome.

Thermal stresses and buckling are covered by extensions of standard methods. Professor Van der Neut provides the only discussion of structural details, with his suggestions for relieving thermal stresses. Detail integrity is as important as overall calculation, and more "nuts and bolts" would have helped this balance. The coupling of aeroelasticity and heating is discussed from first principles. The frightening examples on solid double wedges are now well known, but the effects do not apply with such severity to hollow sections. Finally, as theory needs checking, there are chapters on testing and similarity laws, with a description of an analogue network for determining temperature distribution.

Overall, there is little repetition and the notation is almost consistent. At the price, the work is worthy of inclusion in any technical library, although 70s may be a little high for the individual student.

B. O. H.

Rocket Propellants, by Francis A. Warren. Reinhold Publishing Corporation, U.S.A. (English distributors, Book Centre Ltd., North Circular Road, London, N.W.10). Price 52s. Illustrated.

THE author is manager of the Special Projects Section of the Southwest Research Institute's Department of Chemistry, and has been working with propellants and rockets since 1942. It is therefore a little disappointing to find that his book is too general to be of great service to the rocket engineer. The first three chapters are a straightforward account of solid-propellant systems, ingredients and manufacturing processes, and it is informative and helpful as far as it goes. Mr. Warren is clearly knowledgeable in this field, and his chapters on safety, evaluation, quality control and igniters give much useful information. Sometimes he is tantalizingly indefinite; for instance, he says "a special non-propulsive device has been developed for some rockets so that they will not move if accidentally ignited," but fails to give any description of it.

The discussions of liquid-propellant systems are too elementary to be of value. This reviewer would have preferred the book to be confined to solid propellants, with much more detail about the design of the hardware associated with them.

Mr. Warren's work is often marred by misleading, and sometimes downright incorrect, statements—such as "high-temperature gases pushing against the surrounding air or pistons." The uninitiated can too easily be led astray by this kind of verbal carelessness. The melting point of hydrogen peroxide is not 29 deg F as quoted, and the implication that this oxidant is started by reacting with hydrazine when it is employed as a monopropellant is unfortunate, even if unintentional.

The best chapter in the book, in which Dr. Wiegand collaborated, is that on general performance characteristics. In it the basic equations relating the fundamental quantities are set forth with great clarity and simplicity, and the basic parameters describing the performance of a rocket motor are admirably expounded.

There is a short final chapter on the future of propellants, and free-radical, nuclear, ion and photon propulsion are briefly explained. Also in this chapter is a handy comparison of the temperatures, molecular weights and specific-heat ratios of a number of propellants. The bibliography is copious and much enhances the value of the work.

H. M. B.

A Picture History of Flight (revised edition), by John W. R. Taylor, Hulton Press Ltd., 161-166 Fleet Street, London, E.C.4. Price 35s.

ORIGINALLY published in 1955, this book now covers over twenty centuries of attempted and successful flight with no fewer than 652 well reproduced and accurately captioned illustrations.

A very great deal has been retained of the original work, but changes and additions have been made where necessary, and reflect not only advances made in the past few years but also changing opinions on the more controversial aspects of aviation history. Thus, among other alterations, the notes on Cody, Preston Watson, and Stringfellow have been revised: the last-named, for example, has been stripped of his title of the first man to achieve powered heavier-than-air flight, while grave doubts are thrown on some of the claims previously made for Preston Watson.

Changes at the end of the book consist mainly of addition of new aircraft types—notably the first two Russian Sputniks and the North American X-15, and the illustration of production aircraft where previously only photographs of prototypes were available.

If any criticism must be made—and this is not a book which invites fault-finding—it would be that no space has been found for so much as a mention of the new class of light strike and fighter aircraft being produced for the NATO countries. Apart from this, however, it is practically impossible to find a single event of any consequence that has escaped John Taylor's notice, or of which he has not been able to unearth an illustration.

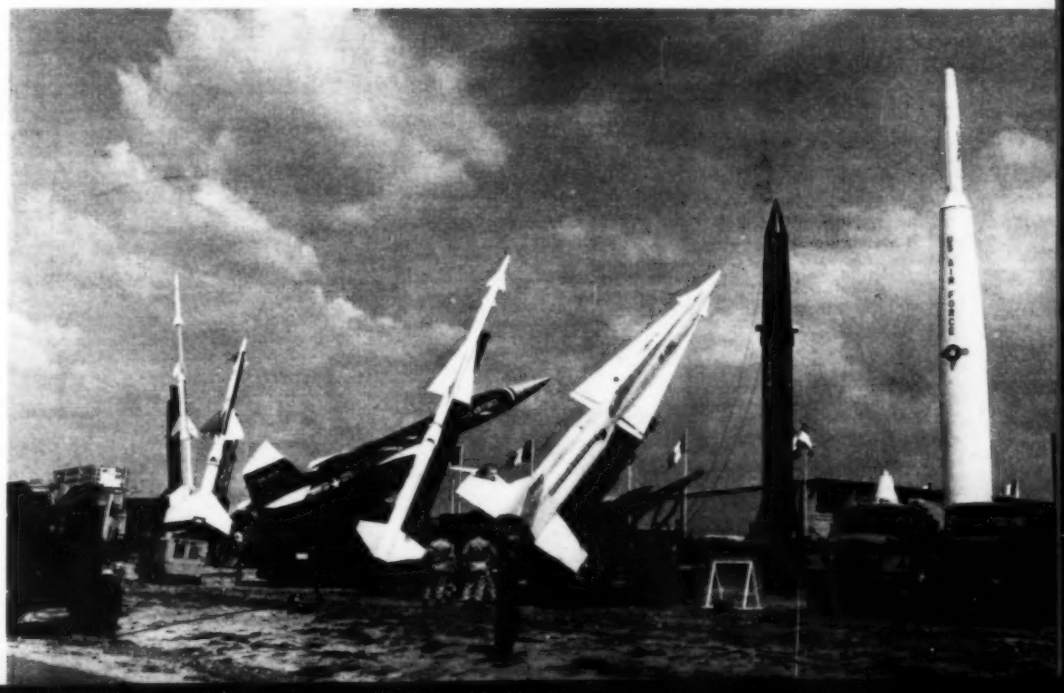
M. R. H.

Le Bourget as seen from the Westland Widgeon on June 14. Below, the missile park

PICTURES FROM PARIS

"FLIGHT" PHOTOGRAPHS

SHOW REPORT: PAGES 18-28



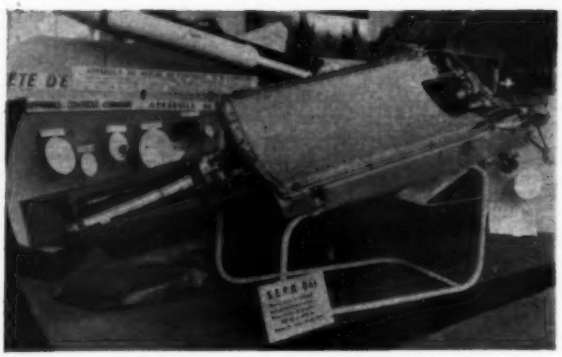
Fiat G.91 with representative loads

Dassault Mirage IIIB

Pilatus PC-6 Porter

PICTURES FROM PARIS...

Simmering Graz Pauker M.222



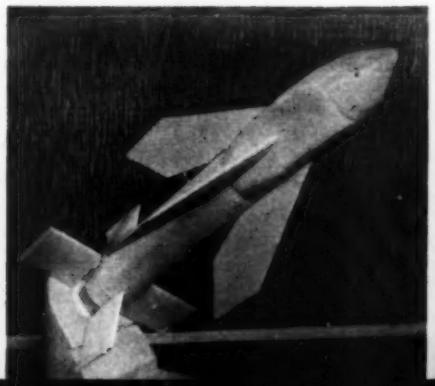
SEPR 841 (Mirage III rocket)

Max Holste Super Broussard

Hawker Hunter Two-Seater and A.W.A. Argosy—both with loads

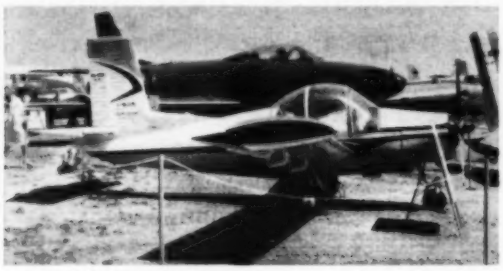
Sipavia S.261

Short Seacat

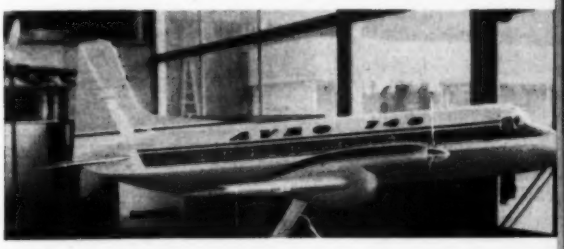


Nord SS.12

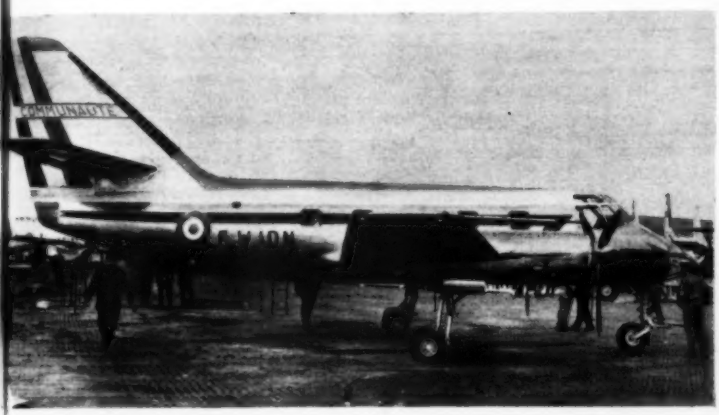
Douglas C-133A



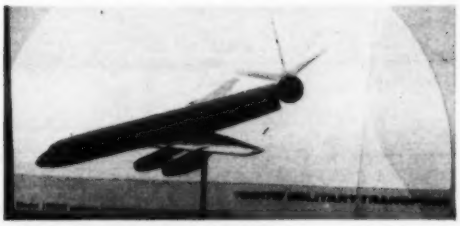
Morane-Saulnier MS.880 Rallye



Model of Avro 748

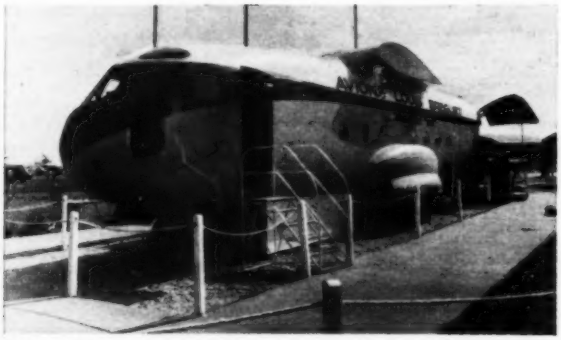


Dassault Communauté

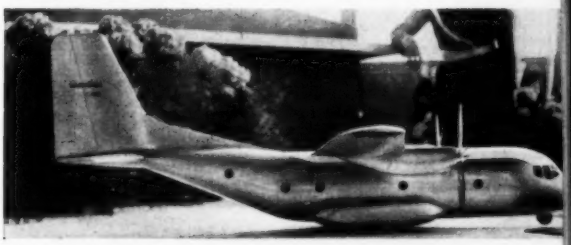


Model of swing-tail DC-8 (1920W)

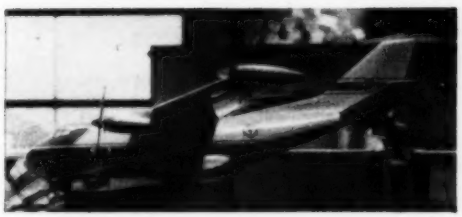
Transall C.160 model



Bréguet 941 Integral mock-up



Aerfer Ae 150



Aeroflot stewardess in Il-18 lounge

Dornier Do 28

XD243
XD243
XD250
XD248
XD267
XD267

Keen Blades

Scimitar F.1s of 807 Squadron, practising for their appearance at the S.B.A.C. Display at Farnborough, are the subject of these exhilarating formation pictures by "Flight" photographer Ian Macdonald. The formation leader is the commanding officer of the squadron, Lt-Cdr. K. A. Leppard; his wingmen in the trio on the right are Lt. P. J. Lovick and D. Pentreath; and in the box in the quartet on the left is Lt. P. H. Perks, with Lt. G. B. Hoddinott in place of Lt. Pentreath. The squadron is based at R.N.A.S. Lossiemouth, Morayshire, and the photographs were taken from a Hunter T.8 flown by Sub-Lt. Ian Aitchison, also of 807 Sqn.

The 23rd Paris Show

AIRCRAFT, MISSILES, ENGINES

Aerfer Ae 150 A model showed the Ae 150 to be a high-wing STOL transport project powered by twin Rolls-Royce Dart RDa.10s. Planned for both military and commercial operations, it has rear loading ramp and is characterized by a very large, swept vertical tail surface. Gross weight is given as 36,380 lb and maximum speed as 267 m.p.h.

Bölkow-Entwicklungen Bö. 103 One of the two complete surprises at the Salon, the Bö. 103 is a free-flying version of the Bö. 102 fixed-base helicopter trainer. It is at present powered by a three-cylinder, two-stroke ILO engine giving 40 to 50 h.p., but can have any engine between 50 and 85 h.p. The latter power would be provided by an Agusta vertical flat-four, or possibly a Porsche.

With the smaller engines the Bö. 103 is only a free-flying trainer, but it could perform useful work with higher power. The structure is of steel tubes, with extensive use of glass-plastics for fairings. The main rotor has a single blade, made of glass-bonded plastics with foamed filling, with a bulky counterweight and a twin-paddle stabilizer bar. The tail-rotor, too, has a single blade. Main rotor r.p.m. are no less than 615. Gross weight is 965 lb, cruising and maximum speeds are 62 and 87 m.p.h. respectively and fuel is carried for four hours' flying. The Bö. 102 fixed-base helicopter trainer, now being supplied to the German Air Force and army, are made either for operation on a metal base or on a floating cushion on water. The device offers stage-by-stage training with realistic handling characteristics and no electronic equipment. Operating cost is accordingly very low.

Bréguet 940 News of some impressive performances by this aircraft was given. With 1,200 total h.p. and weighing 14,700 lb, it has cleared 50ft from standstill in under 210yd, and was then climbing at 1,380ft/min. It has demonstrated a full-stop landing from 50ft and a take-off back to 50ft again in a total distance of 420yd. At 15,300 lb it has landed from 50ft in 250yd, including a ground-run of 110yd.

Bréguet 941 Intégral The full-scale mock-up of the tactical freighter version of this extremely promising STOL was on view, and a passenger version—with a rear-access stairway replacing the freight ramp and doors—was also at Le Bourget. Forecast performance is remarkable. At 37,500 lb gross weight the 941 will carry 40 passengers or 8,000 lb payload for 324 n.m. at over 250 m.p.h. Power is to be provided by four de Havilland Gnomes, giving a total of 5,000 h.p. With one engine failed it will reach 35ft in 787ft. Maximum gross weight is to be 44,000 lb and greatest range 810 n.m. The makers claim that the 941 will be able to use 1,300ft-long fields, allowing for a climb to 50ft and failure of one engine. The first prototype should fly next year.

Bréguet 1001 Taon Both the existing prototypes, painted bright blue, were statically displayed. It appears that neither the 1001 nor the Orpheus 12-powered 1005 Taon 5 has yet been ordered.

Dassault Mirage IIIB The first example of this two-seat multi-purpose fighter was actually perched on the Dassault stand inside the Salon—where it looks remarkably small. It was fitted with its Nord 5103 missile and SEPR.844 rocket motor, and a pack of two DEFA Type 552 30mm guns was displayed beneath it.

Dassault 415 Communauté The prototype at the Salon had completed 18 hours' flying and looked extremely well. Powered by two Turboméca Bastans giving 805 e.h.p. each, the Communauté may be either a crew trainer, command transport for ten passengers, ambulance, ground-attack or paradropping vehicle. Guns, bombs and rockets can be attached beneath the fuselage and wings, and the cabin is pressurized. The rudder is not balanced but fully powered, a v-i. tailplane is fitted, and the ailerons are backed up by perforated spoilers. High-lift flaps and air brakes are also fitted on the slightly swept wing. The levered-suspension main legs shorten during retraction so that the gear units, each of which has two l-p. tyres, can be stowed within the narrow confines of the wing torsion box. Maximum range is 1,600 miles, cruising speed approximately 300 m.p.h., maximum gross weight 13,230 lb, and take-off run less than 1,000ft.

Dassault Etendard IVM The fourth pre-production Etendard IVM, painted dark grey and with its characteristic double-pointed radar nose was on display after first flying only last month. The span of the ailerons has been decreased, and perforated spoilers for lateral control are located ahead of the high-lift flaps. The outer portions of the wings fold, and the powerplant is an Atar 8. The low-level strike radius is 160 n.m.; high-altitude radius is 440 n.m. and ferrying range 1,620 n.m.

Dornier Do 27 In addition to military and civil Do 27s, Dornier were showing the new four/six-seat Do 27 Q4, powered by a Continental 240 h.p. engine instead of the 275 h.p. Lycoming.

Dornier Do 28 Following numerous enquiries from abroad, Dornier have produced the Do 28 as the cheapest possible twin-engined version of the Do 27 STOL aircraft. Fuselage and wings are virtually identical in both machines, but the Do 28 has two 180 h.p. Lycoming O-360 engines mounted on a low-set stub wing carrying two fixed main undercarriage legs. Split flaps and fixed slots are also fitted to this stub wing. Cruising speed is 154 m.p.h. and range 800 miles, and the aircraft has shown very good slow-flying ability.

Helicop-Air Girbel This is an entrant for the Government competition for an *aéronef de grande vulgarisation*. Two versions are to be powered by Continental 90 h.p. or Lycoming 150 h.p. engines and carry respectively 540 lb and 735 lb useful load, cruising at 87 and 106 m.p.h. A low-set wing has end-plates and ailerons and carries the mainwheels of the nosewheel undercarriage. An autogyro rotor provides for low-speed flight and is speeded-up for take-off by a drive from the engine. It is claimed that a fixed-wing pilot can fly this aircraft without conversion.

Hurel-Dubois HD.37 A model showed a two-deck fuselage, accommodating five cars and 28 passengers, which is to be combined with the high-aspect-ratio wing and struts of the HD.34 and, initially, Hercules engines from Bristol Freighters. Later Rolls-Royce Dart 527s could be fitted. The aircraft was reported to have been offered to Silver City; it is not yet known who will build it.

Max Holste MH. 260 Super Broussard Displayed in model form, this version of the Super Broussard is to be the initial production type, having a stretched fuselage and being powered by two Bastan turboprops. Respectively for Sterling area and South American customers, the MH. 270 and MH. 280 will be powered by Bristol Siddeley P.182s giving 1,064 s.h.p. each, or by Lycoming T53s of 972 s.h.p. The prototype MH. 250, powered by two P. & W. 600 h.p. Wasps, is expected later in the week.

Morane-Saulnier MS. 880 Rallye Having only just made its first flight, the Rallye had been accumulating flying time before going to Le Bourget. It is an all-metal low-wing monoplane with a fixed nosewheel undercarriage and powered by a Continental 90 h.p. engine. Two or three occupants sit under a bulging, sliding canopy. This is one of the nine types in the semi-final stage of the official French competition for an *aéronef de grande vulgarisation*. Leading-edge slats and wide-chord, narrow-span slotted ailerons, combine with end-plates and extensive flaps to allow take-off, climb to 50ft and landing in a total of 1,370ft. The trailing edges are blunt.

Morane-Saulnier MS. 1500 Epervier Displayed in a white, blue and brown colour-scheme, the first Epervier has now flown 123 hr, 29 of them with a Turboméca Marcadau and the remainder with a Bastan. It completed its weapon trials at Cazaux in a week.

The Il-18 and Tu-104 looked handsome and very well turned out

The 23rd Paris Show

The second machine is now about to take the air after completing full-scale tests in the Modane wind tunnel. The type is intended for STOL performance from unprepared fields in support of ground troops, carrying missiles and other armament under the wings up to a total weight of 882 lb. Under a large canopy the pilot sits behind and slightly above the missile operator. Full-span slots and high-lift flaps are combined with blunt trailing edges to wings and tail surfaces. Each wing carries a set of three rocket pylons at mid-span and a missile carrier at the tip.

Nord 1500-02 Griffon Potentially the fastest aircraft in the Salon, the Griffon bore a notice of André Turcat's 100 km closed-circuit record set last February at just over 1,000 m.p.h.

Omnipol Zlin 326 A new version with tip-tanks was in the static park; it retains full aerobatic capability with these additional tanks empty. The machine was accompanied by a Super Aero with Walter M-332s, Meta-Sokol and L-60 duster.

Pilatus PC.6 Porter Intended as a utility aircraft for mountainous areas, this new Swiss type is powered by a 340 h.p. Lycoming GSO-480 and carries up to six occupants. Seats can be rapidly removed, and almost the whole of the cabin can be laid open by the big double doors. Moreover, a trap-door in the floor can be opened in flight for supply dropping or photography. When the show opened the prototype had flown 28 hr. A pre-series of five is being built. Several near-firm orders have been received, and production is to start at the end of this year.

The structure is extremely simple, to make production and repair easy, and double-slotted flaps and ailerons provide very high lift. Wing-loading is 12.9 lb/sq ft. The Porter will be able to land on glaciers or small fields 9,000ft up. Wheel, ski or float undercarriages are offered and the price of the basic aircraft is to be about 150,000 Fr. S. (about £12,500). Leading data are: Span, 49ft 10in; length, 34ft 10in; equipped weight, 2,425 lb; gross weight, 3,970 lb; cruising speed, 125 m.p.h.; take-off run, 110 yd; landing speed, 43 m.p.h.; service ceiling, 20,341ft; range, 500 miles. A version with a 260 h.p. engine is also offered.

Saab J32B Lansen An olive-green Lansen all-weather fighter was statically displayed, fitted with four 30 mm guns, Sidewinder missiles and unguided rockets. Gross weight is 22,000 lb, landing speed 122 m.p.h. and it has been in service with the Royal Swedish Air Force for a year or more. The engine is a Flygmotor Avon RM.6B with Swedish afterburner, appreciably more powerful than that fitted to the A32A.

Saab J35A Draken The unpainted Draken displayed bore an Alpine badge, showing that it has been demonstrated in Switzerland. It carries spin-stabilized rockets and two 30 mm guns. Its licence-built Flygmotor Avon RM.6B (reheat thrust 15,400 lb) enables this striking aircraft to reach M 1.8. Rate of climb is 36,000ft/min and landing speed 137 m.p.h. The longer-ranged, M 2+ J35B will have a Saab fire-control radar for collision-course attacks and the 35C will be a two-seat trainer.

Short VTOL/STOL Strike-Fighter A model and drawings showed a Short study for a light fighter/attack aircraft following SC.1 principles and utilizing the same stabilization system. There are eight lift engines and a turbofan with afterburner for propulsion. The aircraft should reach Mach 0.98 at sea level and would be supersonic at height. A one-ton load could be carried over a radius of action of about 250 miles—all at low altitude.

Sipavia 261 Anjou Originally built and flown by Boisavia some years ago, and since handed over to Nord, this machine is now being developed by Sipa, who have installed two 180 h.p. Lycoming O-360 engines with constant-speed feathering propellers. Flaps are hydraulically actuated, and the four/five-seat cabin is covered by a sliding canopy. It is intended that the machine should be competitive with the American light twins. Later, a Sipavia 262 Anjou will carry six people and have 250 h.p. Lycoming O-540s.

Sud SE.116 Voltigeur All work on the Voltigeur and Diplomate was reported to have stopped, leaving the field clear for the Dassault Communauté and Spirale.

Sud SE.3160 Alouette III The second machine, in a dazzling fluorescent red and bright blue colour scheme, was on display, together with a number of Alouette IIs, variously adapted as ambulance, crop-sprayer and television-camera stand.

Sud SA.3200 Frelon Both prototypes of this fine helicopter were at Le Bourget, and one of them made the type's first free flight early on June 10. Both machines were in French Navy colouring, and a model in the static display carried four Nord SS.11 wire-guided missiles under the nose. Another model illustrated the 24-seat passenger layout of the later civil version. The Turmo IIIB free-turbine engines of the prototypes will be replaced by Turmo IIICs rated at 1,100 h.p. Representative missions include 3 hr Sonar watch, 3,000 lb of anti-submarine weapons carried for 200 n.m., or towing of ships or minesweeping with cable tensions up to 6,600 lb.

Transall C.160 A large model on the stand of Nord Aviation revealed the fine lines of this twin-Tyne transport planned jointly by Nord, Hamburger-Flugzeugbau, Weser Flugzeugbau, and Blume-Leichtbau und Flugtechnik. Gross weight will be 90,390 lb, span 131ft and length 97ft 6in. The fuselage is strongly reminiscent of that of the Hercules.

ENGINES

Bristol Siddeley Olympus A BOl. 7R was on view, together with the striking caption, "An advanced version of the Olympus with reheat has a thrust of 33,000 lb."

de Havilland Gnome As we reported recently, the first British-built Gnome ran successfully on June 5. The engine incorporates an entirely new fuel-control system developed by D.H. Propellers, and this was in evidence on the second production Gnome H.1000 which was on display. A helicopter engine, the H.1000 is shortly to fly in a Whirlwind (which has already logged many hours with a G.E. T58 installed) and has been selected for the Italian Agusta 101G.

Another exhibit featured the P.1000 turboprop, not previously seen in public. The display model was fitted with the new de Havilland 2500-size three-blade propeller. Engines of this general type will be fitted to the Bréguet 941 STOL.

General Electric T64 G.E. and the U.S. Navy have jointly disclosed technical information on their new high performance turboprop, which was on display in Paris. The U.S. Navy contract, valued at $58m, provides for design and development up to the 150 hr qualification stage of turboprop, turboshaft and direct-drive engines all utilizing the same basic gas-generator.

Like all the recent G.E. engines, the gas-generator has a single-spool compressor of high pressure ratio, handling being improved by the use of variable-incidence stators. Construction of the compressor is entirely of steel and the blades of the intake guide vanes and the first six stators are variable, the final eight stages being fixed. The compressor delivers to an annular combustion chamber, fed with fuel from 12 burners and provided with split upper and lower half-casings. The gas-generator turbine has two stages; the independent output turbine has a single stage and drives to the front end by a concentric shaft.

In turboprop form the reduction gearbox is offset below the axis of the gas-generator as in the Allison 501. Starting may be effected mechanically or by a low-pressure air impingement starter operating against the gas-generator turbine. Controls and accessories are grouped beneath the intake casing, and much thought has been devoted to improving the engine's accessibility and ease of stripping. Principal data:—

Model	Type	Output (r.p.m.)	Weight (lb)	S.f.c.	S.h.p.	First run
T64-4	Turboprop	1,150	1,079	0.522	2,570	January 1959
T64-2	Turboshaft	5,200	854	0.506	2,570	March 1959

Six YT64s are running at the Small Aircraft Engine Department at Lynn, Mass., and a total of some 400 hr has so far been logged. Full qualification is scheduled by August 1961 in the case of the T64-2 and for December of that year for the -4 turboprop.

The only application so far named concerns the final derivative of the Sikorsky S-60 flying crane, but a wide variety of other airframes are being designed around this attractive powerplant. In many applications the T64's ability to operate at any angle between −45 and +100 deg is proving an advantage.

ILO This unusual two-stroke has three superimposed cylinders, each with its own carburettor. Basic rating is 40 h.p.; it is flying in the Bö 103 helicopter.

The 23rd Paris Show

Potez 4E Almost the only manufacturer to show a completely new piston engine was Potez. The 4E is a flat-four, of exceedingly neat design, rated at 96 h.p. at 2,530 r.p.m. and 90 h.p. at 2,475 r.p.m., with a cruising s.f.c. of 0.5 (80-octane fuel) and weighing 203 lb with all equipment.

Pratt & Whitney JT3D For the first time in Europe this big turbofan engine could be studied in cutaway form. Comprehensive details were contained in our issue of December 19 last, and a cutaway drawing appeared in our issue dated March 20 this year. The basic JT3D-1 has a sea-level rating of 17,000 lb at 8,200 r.p.m. Engines of this type may be obtained by converting existing JT3C-6 and -7 units, and a decision to do so may be taken by a number of airlines. The military JT3D will power the Boeing B-52H bomber.

Pratt & Whitney JT4 It is particularly appropriate that a cutaway JT4 should have been on display in Paris, since engines of this type will be manufactured under licence by SNECMA to power the production Mirage IV (and JT4s have also been chosen by Air France and the two French independents for their large jetliners).

Dry rating of the current JT4A-3 is 15,800 lb; the -9 and -10 engines will maintain 16,800 lb up to 90 deg F with water injection. Like the JT3 family the JT4 series are being subjected to a weight-reduction programme which has already lopped some 200 lb from the 5,020 lb of the JT4A-3.

Rolls-Royce Complete display engines, shipped from Derby, included the Conway 505 (a complete Boeing 707 powerplant package, complete with thrust-reversal and a quiet nozzle), a Tyne RTy. 1, a commercial Avon RA.29, a military Avon RA.24R and a RB.108 VTOL engine. On view for the first time in public were the "hot" components of a Dart which have logged many thousands of hours, and a display panel featuring a cutaway drawing of the Tyne.

RR.2 Svenska Flygmotor were permitted to exhibit, but not to comment on, the RR.2 ramjet. Developed for cruise propulsion of a Swedish missile, this unit is designed for M 2.5, has a two-shock intake, with a hole in the centre of the bullet to feed the turbopump, and an overall diameter of some 10in. It could be seen that there were eight radial fuel bars, each with four upstream nozzles.

SEPR.81A A private-venture engine, the 81A is the first of SEPR's many nitric acid/furaline rocket motors to have variable thrust. The minimum sea-level rating is 1,100 lb on one chamber; thrust can then be built up to 3,300 lb, at which point the second chamber cuts in. Maximum thrust from both barrels is 7,497 lb. The package contains a turbopump unit, and weighs 353 lb.

SEPR.844 Over 100 of these neat single-chamber rocket-motor packages are being manufactured for the Dassault Mirage IIIA (one was also fitted to the IIIB on view, although this is not standard). Operating on nitric acid and kerosine, the 844 can be set to either of two levels of thrust (1,650 and 3,300 lb) by a gated cockpit lever; the feed pump is driven from the Mirage's Atar turbojet, absorbing 93.5 h.p. The chambers for these motors are made by Hispano.

Turboméca Astazou Now flying in the Max Holste 153 Broussard, M. Szydlowski's diminutive single-shaft turboprop is now rated at 420 h.p., much more than its design figure. Consumption at this power is 280 lb/hr and the weight, including the two-blade 2,420 r.p.m. v-p. propeller, is 408 lb.

Turboméca Bastan Figures now finalized for this very neat turboprop include: max. rating, 740 h.p. plus 146 lb thrust, with s.f.c. of 0.704 lb/hr/s.h.p.; max. cruise rating, 592 s.h.p. plus 146 lb, with s.f.c. of 0.749; and weight, with three-blade propeller, 772 lb. It is available as a standard engine-change package, flight-tested on a pylon above a Languedoc.

Turboméca Turmo IIIB Now flying in the Frelon, this free-turbine unit is in an advanced state of development, and the following figures have been established: take-off rating, 789 s.h.p. with s.f.c. of 0.726; max. cruise rating, 631 s.h.p. with s.f.c. of 0.756; and total equipped weight, 600 lb

Turboméca By-pass Next year Turboméca will introduce an entirely new by-pass turbojet, with an outstanding performance for a small engine. Maximum rating will be 1,700 lb, with s.f.c. of 0.59; cruising ratings will be 1,235 lb at sea level (s.f.c. 0.57) or 419 lb at 29,500ft (s.f.c. 0.88).

MISSILES

Bofors Bantam Developed as a private venture, the first Swedish wire-guided anti-tank weapon weighs only 13.25 lb, and is fabricated from glass-reinforced plastics. It is controlled by trembler spoilers and can be fired from the hip, using its box as the launcher.

Bölkow Bö 810 Cobra With this wire-guided anti-tank missile Bölkow have tried hard to beat the classic SS. 10. That they have succeeded is evident from the specifications: Cobra weighs but 20.9 lb, and can be used without any extraneous gear, and its hollow-charge warhead weighs but 5.5 lb yet has the same penetration as that of the SS. 10; moreover, the German weapon is claimed to be much cheaper. It is in production for the German army and is being demonstrated next month to certain European countries.

Matra R.422-B3 Not previously exhibited, this fairly conventional anti-aircraft missile is competing with Nike Hercules (also seen at Paris) and projects by Nord and Sud for the French and NATO markets (Hawk was not mentioned in this context). Initial guidance is effected by radar command, the reinforced echo from the lamp set being compared by a computer with the optimum course; in the terminal phase the 422 is a semi-active homer. Both sustainer and tandem boosts use solid grains.

Nord 5301 At least 12ft in length, the shapely 5301 missile is essentially a Nord 5103 scaled up for use in the surface-to-air role. It thus comes into the category of Hawk, and is said to have a similar performance. The solid propulsive charge exhausts through two boost and two cruise nozzles, control (radar-command guidance) being effected by jet deflection.

Nord CT-41 First seen at SHAPE six weeks ago, Nord's twin-ramjet target is promising to become the best in the world with high supersonic performance. It is quite large (span 12ft 3in, length 32ft 2in), and with its twin solid boost motors weighs 5,622 lb at launching. The five main portions may be quickly assembled in the field; guidance is by radio command and the control system comprises a canard foreplane and lateral, wedge-section spoilers outboard of the engines. Several CT-41s have been fired, and the cruise Mach number is stated to lie between 2.5 and 3.

Nord SS.12 Never before seen in public, Nord's latest weapon is virtually a "stretched" SS.11, and will be employed in both surface-to-surface and air-to-surface roles. No data may be quoted, but it is larger, heavier and faster-flying than SS.11, and has much greater range; firing weight is obviously more than 120 lb. A curious feature is the bulged warhead compartment, conferring a degree of area-ruling. The SS.12 employs the same propulsion and guidance techniques as those used in its predecessors.

Parca Now regarded as an interim test vehicle, this canard surface-to-air missile was displayed in cutaway form on the stand of Compagnie Francaise Thomson-Houston. Current Parcas have rectangular wings.

Short Seacat Although simple, Seacat is a highly significant anti-aircraft missile which has not previously been publicly displayed. Intended as a logical replacement for all short-range A.A. guns in the Royal Navy, the Seacat has a cruciform of moving, swept wings, a fixed tail cruciform (indexed at 45 deg and carrying flares), a bulging, square-section nose and a solid motor (presumably with boost and crüise levels of thrust). Guidance seems clearly to be effected by radio command, and the missile is launched from an overhead rail in which is located a spigot on the missile body. Overall length is some 58in, and the wing span about 25in.

Sud SE.4200 The vehicle portion of this weapon system is a small pilotless aeroplane, launched by solid boost motors and with cruise propulsion provided by an integral ramjet, which can carry an underslung bomb-load weighing between 287 and 551 lb. All portions of the weapon system were displayed, including the motorized ramp launcher, the command vehicles and the radars. The latter, developed at Sud's Applied Physics Laboratory, comprise the TMt dishes (a transmitter and receiver for continuous control of the trajectory to within ±15m and injection of the "dive" command) and the PDt set for guidance in the vertical plane) accurate to one ten-thousandth of a radian, or ±10m at 100 km range. The system can handle several missiles simultaneously; maximum range of the missile is 56 miles.

Sud SE.4400 This surface-to-air missile is still in the experimental stage. Powered by an internal ramjet, the test vehicle displayed had a capacity of 12.4 gal of kerosine, is 23ft 7in long (15ft 2in without the tandem boost motor), weighs 2,640 lb (770 unboosted) and flies at M 3.6 at 164,000ft [*sic*] altitude. The telemetry gear was stated to record 12 continuous parameters and to sample 3,950 points per second.

The Outdoor Park For the record, herein were found the following: Armstrong Whitworth/G.E.C./Sperry Seaslug, in an operational-type twin launcher; Bristol/Ferranti Bloodhound; English Electric Thunderbird Mk 1; Vickers-Armstrongs Vigilant (+ simulator); Boeing IM-99A Bomarc; Chrysler Redstone (32nd Artillery Brigade, U.S. Army); Convair Atlas (old 14A, hot from Las Vegas); Douglas Thor-Able; Douglas-built Western Electric Nike Ajax and Hercules; Douglas-built Honest John; three Raytheon Hawks on their Northrop loader; Martin TM-76 Mace (38th Tactical Missile Wing, U.S.A.F.); a Discoverer-type top end; a Radioplane RP-77B; Matra R.422; Sud 4200; Sud 4400; and batteries of Nord SS.10 and 11 wire-guided anti-tank missiles.

Precision in Airline Management

BEA IS OUTSTANDING AMONG EUROPE'S AIRLINES IN PROVIDING MANAGEMENT WITH AN INTERNAL CONSULTANCY SERVICE TO AID DECISION TAKING

EFFICIENT management and a subsidized industry seldom go together. It is probably for this reason that scheduled airlines as a whole have not been especially noted for their approach to management problems. But as the subsidy era vanishes from the air-transport scene so the need for disciplined decision-taking grows.

Yet many airlines remain suspicious towards those whose scientific training and attitude could be used to reduce managerial uncertainty. The so-called "efficiency experts" are disappointed but not surprised at this reception. For at least two hundred years, since Perronet was conducting time studies into the manufacture of pins, cynics have looked askance at those who maintain that scientific method can assist executives in solving managerial problems.

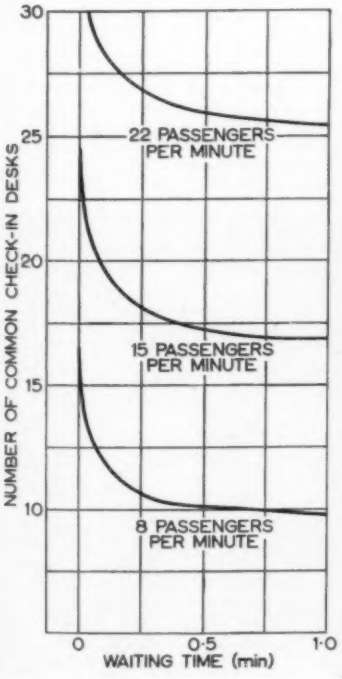
A wider acceptance of scientific management owes as much to World War II as does air transport. Organization of large-scale defence programmes, at a time when human and material resources were in short supply, revealed the need for a disciplined approach to the problem of administration. Similarly, the military commanders soon came to realize the value of referring some of their more complex tactical and strategic problems to analytical study by people trained in scientific disciplines.

This later development can be traced back to the early days of radar, when Sir Robert Watson-Watt was responsible in 1937 for launching two research studies into operational activity. The first was an investigation into the discrepancies between radar tracks and navigators' logs, the other was a thorough scrutiny into the entire telecommunications system of Fighter Command. The success of these investigations led to the attachment of specialist civilian staff to H.Q. Fighter Command, and shortly after the outbreak of war every R.A.F. command had its own "Operational Research Section" (the term "operational research" was claimed to have been coined by Sir Robert Watson-Watt). Later both the Army and the Navy recruited scientifically trained staff in similar rôles.

The air transport industry, being young and dynamic, would seem an ideal field in which to apply scientific method to managerial problems. Yet, with the exception of the leading U.S. carriers, remarkably few airlines have elected to employ such techniques. There are probably two reasons. The first is historical and reflects the prevalence among airline upper management of that group which the late John Longhurst described as "the goggle men." Few in this group had enjoyed a scientific training, and their own past success left them convinced that airline businesses could be run perfectly well without recourse to the fanciful notions of "efficiency experts." The second reason is a widely held belief that airlines are laws unto themselves—that ordinary rules of commerce and principles of industrial management do not apply because of the industry's complexity and unpredictability. There is, of course, a large measure of truth in this: the industry has in the past been dominated by politics rather than economics. But there are signs that this situation is changing for the better: politicians (and taxpayers) are increasingly coming to realize the folly of ignoring the implacable laws of supply and demand. This development coincides with a growth in the average size of individual airlines, and it brings in its train more than a proportionate increase in the perils of relying on rules of thumb and on hunches. In short, the scope for disciplined airline management is growing daily.

One of the first European carriers to realize this was British European Airways. In 1952 a small unit was set up to look into various management problems of an administrative and operational nature. It has since existed as an independent unit, responsible direct to the Chief Executive, for providing the airline's management as a whole with a staff service on a consultancy basis.

Since its inception the Organization and Methods Branch, as it is called, has been headed by Mr. Brian Brough, an engineer who before joining BEA was responsible for some pioneer work in the analysis of aircraft defects in the Scientific Advisor's Department of the Air Ministry. Mr. Brough's views on the application of scientific method to management problems have to a large degree determined the manner in which the branch operates. The core of BEA's philosophy is the need to establish and retain confidence between the airline's executives and the O. and M. Branch. To this end a number of unwritten rules have been established. First, any executive is free to approach the unit direct regarding any problem falling within his sphere of responsibility. Second, formal O. and M. reports resulting from study of a problem are regarded as confidential between the Branch and the executive seeking assistance. Third, should higher management consider that an O. and M. study of a particular activity is indicated, then the subordinate executive concerned is directed to consult the



Having decided upon the standard of service required and the volume of business to be handled, it is possible to show graphically the number of counter staff required to deal with passengers as they check in before flights. At the West London Air Terminal such techniques have been employed to strike the optimum compromise between the needs of airline and of customer

A work-study engineer observing aircraft turn-rounds at London Airport

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O. and M. Branch in preference to giving direct instruction to O. and M. to carry out an investigation and report back. Information as to the programme of work undertaken by the branch at the request of different executives is given in a quarterly progress report to the Chief Executive and members of the airline's management committee. Should they then need further detailed information concerning a particular assignment this is obtained from the department concerned through the management line.

BEA believe that the more specialized scientific tools of management can only develop and become effective in an atmosphere where executives feel free to call for help in the knowledge that confidences will be respected and their own position will not be abused as a result of information acquired by the specialist investigator. It is for this reason that the rôle of the O. and M. Branch is clearly recognized as that of an advisory staff service designed to aid decision making.

A testimony to the wisdom of adopting this policy is the impressive list of assignments that have been undertaken by the O. and M. Branch during the last seven years and the large number of requests for assistance which continue to be submitted.

Much of the jargon and terminology used in this particular field of scientific management study is apt to cause confusion to the outsider. There is debate even among certain practitioners of these study techniques as to where their particular specialization ends and others begin. BEA, however, do not interpret the term Organization and Methods in any narrow sense but stretch it to provide a convenient omnibus label to cover all the techniques that have been developed to search out ways and means of improving the administration and the operations of a business. Thus, under this one title, there are some twenty specialist staff, with a wide range of qualifications and experience, divided into four sections—Operational Research, Data Processing Study, Systems Study and Work Study.

The Work of Each Section

The Operational Research section is led by a mathematician, Mr. Alec Lee, and is primarily concerned with complex action-type problems involving several variables which can only be solved by the use of statistical and mathematical methods. Linear programming, the theory of games and queueing theory are typical of these methods. Their use often makes it possible to calculate precisely the optimum deployment of resources to meet particular operating requirements in situations where previously the factors involved were considered too intangible or random in nature for decisions to be based on anything other than guesswork.

A typical optimization problem facing BEA concerns passenger check-in systems. Looking at check-in from the passenger's point of view, three things are required: there should be a minimum of queueing, service should be expeditious, and there should not be any need to move around unduly from one desk to another. The airline, on the other hand, seeks to obtain maximum staff productivity and to ensure punctual departure. The airline can operate with various numbers and positions of check-in desk, and with different check-in systems (either allocating specific desks to specific flights or allowing passengers to use any desk, or making a compromise between these two arrangements under which only last-minute passengers are directed to a specific desk).

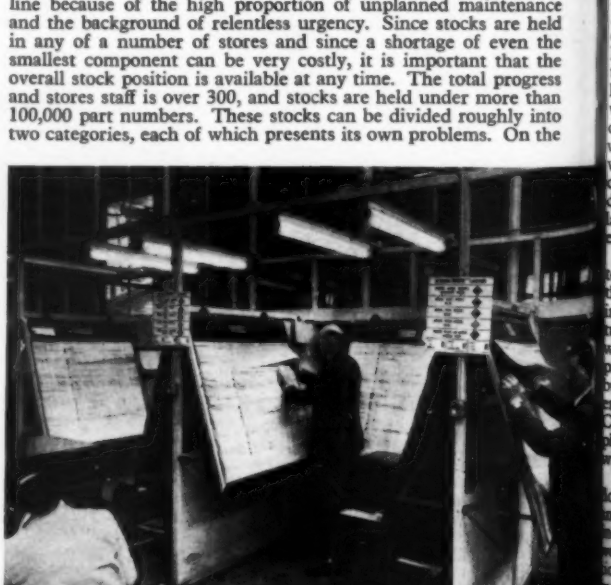
It is a matter of policy to decide upon the standard of service to be provided, but once this is defined then O.R. techniques can be used to determine the most economical way of providing that service. The basic tool in solving problems of this type is the theory of queues, developed (largely by telecommunications engineers) over the past fifty years since the pioneering days of Karl Erlang in Copenhagen. This theory permits the calculation of customers' waiting times when information is available concerning the manner in which customers arrive, the order in which they are served, the number of servers and the time taken to serve each customer. In the airline case, this information can be estimated only by close observation of the manner in which passengers arrive at the terminal and of the manner in which they are served, and then relating this information to the estimated flow of peak traffic.

However, from an analysis of these observations it is possible to plot the number of staff required against the standard of services obtainable measured in terms of average waiting time (see graph), thus providing a factual basis for management decision regarding the number of desks to be provided and the staffing needed to deal with different rates of flight departure.

The airline industry offers wide scope for the application of O.R., and BEA are currently engaged on applying these techniques to a number of different problems. Mathematical model building and linear programming are being used in an endeavour to determine better methods for calculating holdings of aircraft spare parts (currently valued at over £4 millions), and for evaluating the optimum balance between floats of repairable components and overhaul-shop capacity. Statistical methods developed for the analysis of birth and death data have been found applicable to the growth of bookings in connection with a study directed at improving control over seat reservations. Similar mathematical methods are also being used to determine the allocation of advertising expenditure among different media in order to obtain maximum readership; to prepare complicated staff duty rosters so as to cover essential tasks with the minimum staff; to calculate the number of crew-duty cars required at London Airport; and to solve a variety of similar problems.

It is widely recognized that there comes a stage in the growth of any organization when the technical economies of scale become offset by problems of administration and co-ordination. The aim of the Systems Study Section, under Mr. G. L. Hall, is to avoid this evil moment by tackling the problems of paper-work and of communications (in the widest sense) between various departments so that growth may be a process of progressive adjustment rather than haphazard expansion.

At one end of this section's work are such straightforward jobs as the design of forms or the evaluation of office equipment. But an example of a more extensive task is provided by their investigation into the progress and stores systems at BEA's engineering base. Stores control is unusually difficult for an airline because of the high proportion of unplanned maintenance and the background of relentless urgency. Since stocks are held in any of a number of stores and since a shortage of even the smallest component can be very costly, it is important that the overall stock position is available at any time. The total progress and stores staff is over 300, and stocks are held under more than 100,000 part numbers. These stocks can be divided roughly into two categories, each of which presents its own problems. On the



Production control staff in the BEA Engineering Base working on the new charting system for recording component overhaul progress

The BEA Apron Control Section at London Airport, where both operational research and work study techniques have been applied to improve the method of control and ensure strain-free working conditions

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one hand the majority of items are consumable and have to be replenished upon issue from stores. On the other hand the major components (roughly one-eighth of the whole) are repaired in the workshops and are only replaced when beyond economical repair.

As a result of system study into consumable items, the central stock records—which were posted from requisitions passed from the various sub-stores—were abolished and in their place a more efficient bin-card system was introduced in the sub-stores. The only central record which is now retained is an index showing the location of stock and this is linked with all sub-stores by intercom equipment. Under the old system requisitions took a long time to clear and the time lag considerably reduced the value of the central stock record. Under the new system requisitions can be cleared more quickly, and a demand presented at one sub-store which cannot be met direct can be cleared at another within minutes by way of the central index. The previous system often required half an hour's effort by a progress chaser.

Transferring its attention from consumable to repairable items, the Systems Study Section found that it would be desirable at the outset to move the appropriate stock records to workshop level to provide a better location from which to progress the work. It was then evident that visual records were needed to allow the serviceability state of components to be seen at a glance. After consideration of various forms of presentation, it was decided to adopt a visible-edge card charting system. This is now installed and in operation.

Two other important changes were made as a result of this study. First, the number of separate sections in the Production Control organization was reduced. This has given much greater flexibility and at the same time has clarified responsibilities. Secondly, in the case of many repairable components a buffer stock has been introduced which is used to replenish components which have been scrapped. This locates the history of scrapped components in one record and gives the Purchasing Branch a more accurate idea of the demand for replenishment of these items.

Other tasks undertaken by the Systems Study Section have included a study of the aircrew rostering procedure and the development of a new method for preparing and publishing the monthly and working rosters, a review of the training organization, the introduction in head office of a machine dictating system and of a document copying service, an investigation of catering and cabin equipment accounting procedures, and the development of special add-listing machines for accumulating aircraft passenger and baggage weights. Currently a study is being made of cargo handling documentation and office procedures.

Job Simplification

Work Study is another aspect of the Corporation's O. and M. Branch activities. Work-study techniques are, of course, familiar in industry for such purposes as rate-fixing and for improving the efficiency of repetitive manual operations of mass production. Indeed, many outsiders associate the technique with such entertaining spectacles as strapping coloured lights on to employee's limbs and indulging in all manner of trick photography and stop-watch timing. In BEA the possibilities of employing such aspects of work analysis or measurement are few: there is little repetitive work. For this reason the Work Study Section is more concerned with production problems and method improvement than with conventional time study. In the main this section's efforts are directed towards avoiding unnecessary use or waste of manual labour, and studying flow and handling problems and the "human engineering" aspects of new buildings and equipment.

While many problems of work simplification are assigned direct to the section, much work is done in support of other sections in the branch. A recent request for help with problems experienced in the BEA Apron Control at London Airport provided an opportunity for such co-operation. This control, which is concerned with monitoring and co-ordinating all ground operations necessary prior to flight departure, is in liaison not only with the tarmac but with all the sections involved in flight preparation, such as engineering, passenger handling, cargo catering and load control. Communication is by means of radio, special intercom and telephone channels. In a single peak day the section may be concerned with up to 400 arrivals and departures.

Following an Operational Research study of the information flow-pattern, it was decided that a certain re-allocation of duties and responsibilities was required and that certain improvements in communication facilities and in the display of information were necessary. Engineers of the Work Study Section, in collaboration with the O.R. team, studied these new equipment requirements and designed special control desks and display boards to give practical effect to the O.R. recommendations and to assist in allowing strain-free working conditions in what, at times, can be a high-stress situation.

Other activities of the Work Study Section have included the introduction of pallets and mechanical handling equipment in the BEA Cargo Unit at London Airport; the design of data display equipment, controllers' desks and communication facilities for the Operations Control Centre; studies into methods for the packing and dispatch of stationery and publicity material; stores handling problems in the new Engineering Base; the washing up of cabin catering equipment; and a number of similar tasks.

The most recent unit to be established in the O. and M. Branch is a Data Processing Studies Section. At present it comprises an economist, Mr. Roy Anderson, and a team of three investigators, soon to be increased to five. The main task undertaken by this section so far has been to explore the feasibility of employing an electronic computer for the processing of revenue data (which represents some three-quarters of a million transactions during a peak month). As a result of this study BEA have recently decided to order an E.M.I. Emidec 1100 computer for processing revenue data and for other Head Office accounting work.

A particular problem here is the need to obtain early information on revenue by individual routes. Some success in reducing the large volume of work of calculating and analysing revenue has been achieved by the use of sampling techniques, but the complexity of international fare rates and route patterns have in the past limited sampling to the more straightforward routes. A technique has now been developed, however, whereby electronic data-processing will allow all routes to be sampled. This will eliminate the present tedious practice of pricing coupons manually and will overcome the difficulties inherent in operating a comprehensive sampling scheme by manual methods.

At an early stage in their investigation into processing route revenue data the section found that sample inaccuracies usually resulted from variations in ticket values and that small samples could be accurate if a satisfactory means of weighting tickets (to reduce the effect of varying fare categories and journey lengths) could be found. To design and test a sampling method incorporating the theoretical weighting concept, a large volume of data had to be analysed, and it was decided to employ a computer for this preparatory work also. A programme was accordingly prepared and the data analysed on a rented computer. The results of this and subsequent programmes have shown that determination of passenger route revenue by automatic sampling to be a practical proposition.

Consideration is also being given to the scope for automatic data processing in the Engineering Base. Introduction of punched cards for material provisioning and stock records will provide for use of the ATA 200 specifications (this allows component provisioning data to be exchanged between aircraft manufacturers and operators in the form of punched cards). Other potential fields to be investigated in the engineering base are maintenance planning, shop loading, production control, labour costing and defect analysis.

A third major data-processing field which has been investigated in considerable detail is the control and recording of seat reservations. BEA is faced with a thorny booking problem. Being short haul, the airline handles a large number of passengers (over three million) annually; the average one-way fare is very low, approximately £9·3 only; demand is very seasonal and, during the peak period, is often in excess of capacity; and a large proportion of bookings are made months in advance. These factors, coupled

Precision in Airline Management . . .

with the nature of a route network which concentrates reservations control in London, clearly justify consideration being given to an investment in data-processing equipment designed to reduce reservation costs, improve service to the public and improve load factors by eliminating the wastage of seat space caused by the inevitable slowness and other shortcomings of a manual system.

Operational Research and Work Study techniques have both been employed to analyse the performance of the present system. These studies provided the basis for an examination of the scope for introducing electronic machinery to the reservations system by determining exactly where mechanization can be employed, and have also provided estimates of the work load to be handled by any future system. They show that by 1963 the BEA Reservations Control office in London will have to maintain some 200,000 unit flight records capable of being queried for seat availability from local sales offices. The expected peak rate of availability queries from these offices will be 1,400 per half hour and the expected peak rate of bookings and calculations which will have to be posted to the flight records from all sources will be as much as 1,600 per half hour. In addition, the number of individual passenger booking records to be maintained by the London office at the peak period will total about 2.7 million. An outline of BEA's requirements was drawn up in 1956 in consultation with the Reservation and Sales Branches and issued to computer manufacturers. This was followed by a more detailed specification issued in October 1957 after further study of the problem. Since then certain selected firms have been making design studies of BEA's requirements and the results of these are currently being considered by the O. and M. Branch.

The experience of this airline has shown that there is no limit to the managerial applications of scientific techniques in the air-transport business. Equally important, it has demonstrated the need to secure a favourable attitude within the firm towards these techniques. Significant successes will only be realized when executives at all levels, feeling assured that confidences will be respected, can come to look upon the specialists in this field as friendly advisers rather than the bloodhounds of top management.

J. C. S.

MINNESOTA TO THE TRANSVAAL

READERS may recall seeing, in *Flight* for September 12 of last year, a note on the operations of Trek Airways of Johannesburg ("Africa's Leading Independent," p. 473). The present writer found this short article of particular interest, and it is perhaps appropriate for him to record briefly some facts on the colourful careers of the two ex-Northwest Airlines Skymasters which almost a year and a half ago started a new lease of life with Trek.

These aircraft were, in fact, the eleventh and thirteenth production civil DC-4s (Series 1009) built at Douglas Santa Monica in March 1946, and they went into service on Northwest's domestic routes in June of that year. They were registered N.6402 and N.6403 (Douglas CN's 42911 and 42913) respectively. In addition, a third DC-4 Model 1009 was delivered to Northwest in the same period, this being N.6404 (CN.42914). The airline also acquired 21 additional DC-4s between 1945 and 1947, but all of these were converted C-54s purchased from both Douglas and the U.S. War Surplus Assets Board. Currently, Northwest still have 15 DC-4s in the fleet, which includes B-377s, DC-7Cs and 6Bs and even five DC-3s.

During their eleven years of unbroken service with Northwest, N.6402 and N.6403 logged the impressive totals of 42,000 and 38,000 airframe hours, with an annual utilization averaging 3,800 hr apiece. In September 1946 Northwest embarked upon an ambitious programme of extending its hitherto purely domestic network to various overseas territories as well as serving Alaska and Canada. The C.A.B. awarded this rapidly growing airline permission to operate trans-Pacific schedules to Japan, China, Okinawa, and Manila (via the Great Circle route through Anchorage and the Aleutian Isles); and by December 1948—and despite strong protests lodged by Pan-American to the C.A.B.—Northwest were successful in securing a firm foothold in the highly lucrative U.S. Pacific Coast - Hawaii traffic, with the advantages of operating through flights from Minneapolis - St. Paul via Seattle, Tacoma and Portland.

All Northwest's Pacific schedules continued to be operated by their DC-4 fleet until mid-1950, when Boeing Stratocruisers replaced the DC-4s. With the advent of domestic Coach-class flights by all major U.S. carriers in October 1948, about half the company's DC-4 fleet were converted from the standard (first-class) cabin layout of 44 seats to 60 (non-reclining) seats. The three DC-4-1009s, however—including N.6402 and N.6403—continued to be operated as 44 seaters on first-class domestic (and occasionally trans-Pacific) flights.

Northwest's DC-4 fleet put up a remarkable record in the famous Korean War airlift across the Pacific. In a three-year period (which terminated in October 1950) nine of their Skymasters completed 1,380 Pacific round-trip flights, carrying about 40,000 military personnel together with an estimated 12m lb of military freight.

It is worthy of record that Northwest Airlines first became a member of the U.S. airlines' "top ten passenger carriers" in 1953 when, for the first time, they carried more than a million passengers. Of equal interest is the fact that, in 1958, this airline ranked No. 14 among the world's "top twenty" major carriers as well as taking eighth place in total revenue ton-miles flown. Passengers carried numbered 1,603,000 and total load was 185 million ton-miles.

Already Trek's two DC-4s—registered ZS-CIG and ZS-CIH—have in 16 months of operations (greatly restricted, as the maximum number of round trips monthly is limited to five per aircraft) between Johannesburg and Europe have each flown about 2,500 hr. In terms of "staff productivity" (it has been estimated that 6,000-odd passengers were carried between April and December 1958) "South Africa's little airline with one of the world's longest routes" has a record of which it can be intensely proud.

Is it too much to hope that if and when South Africa becomes a republic the Powers that Be will drastically amend their present stringent restrictions on Trek Airways and the other S.A. independents? Trek would then be in a position greatly to expand their operations, to the advantage of thousands of people in the vast African Continent who cannot under the present financial conditions afford a return trip by air to Europe.

Footnote: Some interesting conjectures are inspired by Trek's fare of £118 for the journey between Johannesburg and Europe. As was pointed out in the *Flight* item referred to above, this is about half the single first-class I.A.T.A. fare of some £230 for the same journeys. As the distance between these cities (via Entebbe and Cairo, where Trek usually night-stop) is 6,000 miles, the fare works out at a fraction under 5d per mile as compared with I.A.T.A.'s first-class fare of about 10d per mile.

Thus it would be theoretically possible for a person to fly coach/air from London to Paris and by Trek from Paris to Johannesburg for as little as £123, compared with the I.A.T.A. tourist fare of £152 or first-class fare of £227. This makes one think, doesn't it?

D. M. P.

ZS-CIG, one of Trek Airways' two DC-4s, seen at Jan Smuts Airport, Johannesburg

SERVICE AVIATION

Royal Air Forces and Naval Flying News

Kentish Javelins

ON Wednesday last week West Malling airfield became a fighter station once again, when Javelins of No. 85 Sqn. flew in from Stradishall to make it their new operational base. They were preceded by a Spitfire and Hurricane, to give the event historical perspective; and are being followed at some future date (probably early next year) by another all-weather squadron, No. 41. So Kentish ears will get used to the noise of Javelins flying from what is now the R.A.F.'s only operational airfield south of the Thames.

Noise was one aspect of the rehabilitation of West Malling stressed by the station commander, G/C. C. N. Foxley-Norris. He admitted that the Javelins were the noisiest aircraft in R.A.F. service, "extremely noisy" even when taxying; and owing to the adjacent M.T.C.A. control areas and zones, extending from 3,000ft to 25,000ft, the Javelins would have to go in and out at 2,500ft or below. Take-off would normally be to the west, but they were not allowed to climb in a westerly direction. These inconveniences, both to civilian population and to private pilots (who must be under Manston control or fly along the Ashford - Redhill railway below 600ft), were regretted; but the R.A.F. would not have been put back into the skies over Kent "without good tactical reasons."

No. 85 Sqn., which is commanded by W/C. G. A. Martin and operates Javelin 2s and 6s, has old associations with West Malling. In 1943 it flew from there with Mosquitoes against targets in Occupied Europe, and it returned there after the war until at the end of 1957 the airfield was closed for runway improvements.

Sea Vixen, R.N.

EIGHT de Havilland Sea Vixens swept into the summer skies above R.N.A.S. Yeovilton on July 2 for an impressive display celebrating the commissioning of No. 892 Sqn., the first Naval all-weather fighter unit to be equipped with these aircraft, which are replacing Sea Venoms. At the ceremony the Flag Officer Training, Rear Admiral D. R. F. Cambell, said that the introduction of Sea Vixens with their Firestreak weapons system "ushered in the Navy's guided missile age." For the first time, he added, the Navy had up-to-date aircraft, radar and ships.

There was a noticeable feeling of pride at Yeovilton for this occasion, not only because of the commissioning of No. 892 Sqn. (which had been working up there for several months as 700 Y Flight under the same C.O., Lt-Cdr. (now Cdr.) M. H. J. Petrie, a New Zealander) but also because of the presence of five Scimitars of No. 807 Sqn. These, too, gave a fine display, and with No. 892 are representing the Royal Navy at Farnborough. Their "team manager" for the S.B.A.C. show is the captain of H.M.S. *Heron* (R.N.A.S. Yeovilton), Capt. D. B. Law.

After the commissioning ceremony Capt. O. N. Bailey, Director of the Naval Air Warfare Division at Admiralty, said that No. 892 Sqn. would embark in *Ark Royal* early in the New Year. Its strength was being increased from eight to 12 aircraft and all Sea Venom squadrons were to be re-equipped with Sea Vixens. R.N. ships and aircraft now had "the world's best radar."

Air Marshal H. D. McGregor taking the salute during a march-past at Bentley Priory when he assumed the post of A.O.C.-in-C. Fighter Command on July 30

IN BRIEF

Air Chief Marshal Sir Thomas Pike, who recently completed his term as A.O.C-in-C. Fighter Command, is making liaison visits to the R.C.A.F. and U.S.A.F. After returning to this country on August 27 he is to tour R.A.F. units overseas before taking up the post of Chief of the Air Staff on January 1.

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Vice-Admiral D. E. Holland-Martin, Second Sea Lord and Chief of Naval Personnel since October 1957, is to be Flag Officer Air (Home) from January next year in succession to Admiral Sir Walter T. Couchman.

* * *

A.V-M. D. J. P. Lee assumed the post of Commander, Air Forces, British Forces Arabian Peninsula, on August 1. He had been secretary of the Chiefs of Staff Committee, Ministry of Defence, since April 1956.

* * *

Several senior R.A.F. officers were honoured on the Queen's birthday, including the following: Acting Air Marshals W. G. Cheshire, A.O.C. Malta, and K. B. B. Cross, A.O.C-in-C. Bomber Command (both K.C.B.); Air Chief Marshal Sir Claude Pelly, Controller of Aircraft, Ministry of Supply (G.B.E.); and Air Vice-Marshals L. Dalton-Morris, A.O.C-in-C. Signals Command, and F. W. P. Dixon, Central Medical Establishment (both K.B.E.).

* * *

Among promotions to rear admiral lately announced by the Admiralty were those of Capt. R. M. Smeeton, whose recent commands have included R.N.A.S. Halfar and H.M.S. *Albion*; and of Capt. C. B. Pratt, a former C.O. of H.M.S. *Nuthatch* (R.N.A.S. Anthorn). The retirement was announced of Rear Admiral A. C. C. Miers, V.C., among whose post-war commands were H.M.S. *Vernon II*, R.N.A.S. Stretton and H.M.S. *Theseus*.

* * *

Among half-yearly promotions announced on July 1 were those from air vice-marshal to air marshal of Acting Air Marshals Sir Denis H. F. Barnett, A.O.C-in-C. Transport Command; Sir Edward Chilton, A.O.C-in-C. Coastal Command; and H. D. Spreckley, Controller of Engineering and Equipment, Air Ministry. Six new air vice-marshals (promoted from air commodore) were named: Acting A.V-M. D. R. Evans, Commandant, School of Land/Air Warfare; Acting A.V-M. C. T. Weir, Deputy C-in-C., Headquarters M.E.A.F.; A. Cdre. P. H. Dunn, Deputy Air Secretary, Air Ministry; Acting A.V-M. F. S. Stapleton, Head of the U.K. Joint Services Liaison Staff, Canberra; Acting A.V-M. R. C. Storrar, S.A.S.O., Maintenance Command; and Acting A.V-M. C. A. Rumball, Senior Consultant, Central Medical Establishment.

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No. 230 Sqn., which flies Pioneers and is based at Upavon, received a C-in-C.'s Commendation in the Queen's Birthday Honours. This was the first award of its kind to a squadron in Transport Command, and was made in recognition of the rapidity of No. 230's move to Cyprus late last year and for its work out there. The squadron, whose Army support rôle was described in *Flight* for December 5 last year (page 852), went to Cyprus at less than a week's notice to take part in anti-EOKA operations. During some four months there it flew more than 800 hr and made 2,084 landings on roads and small airstrips, among other tasks lifting over 1,500 passengers. Shortly before going out the squadron had been cleared for air re-supply duties, and its first operational attempt at this was successfully carried out in support of an Army brigade in the Troodos Mountains, when 12,000 lb of rations were delivered in 232 drops (mainly free-falling).

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A. Cdre. H. J. Maguire is to be Senior Air Staff Officer, Fighter Command, from August 28 with the acting rank of air vice-marshal. He has held a similar appointment at No. 11 Group since May last year.

* * *

A. Cdre. C. H. Hartley has been appointed A.O.C. No. 12 Group, Fighter Command, with the acting rank of air vice-marshal. He has been S.A.S.O. of the Group since August last year and was previously Eastern Sector Commander.

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W/C. James Dell, who has been Fighter Command liaison officer with English Electric, is to command the first R.A.F. squadron of Lightnings.

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The Type 984 radar installed in H.M.S. *Victorious* considerably impressed American observers during the carrier's recent participation with U.S.N. units in Exercise Riptide.

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Maj. H. B. Warburton of the Joint Experimental Helicopter Unit, Middle Wallop, recently became the first Army Air Corps officer to complete 4,000 hr flying.

* * *

G/C. A. G. ("Sailor") Malan visited his old squadron, No. 74, at Coltishall on July 17 and was presented with a silver model of a Hunter and a new squadron tie.

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Two amalgamations of F.E.A.F. units have recently taken place. The helicopter squadrons at Kuala Lumpur, Nos. 155 and 194, have joined forces as No. 110 Sqn. This is commanded by S/L. F. Barnes, formerly C.O. of No. 194 Sqn. At Changi, Singapore, the F.E.A.F. Parachute School and Survival School have been merged to form the Far East Survival and Parachute School.

* * *

Two record long-distance flights have recently been made by R.A.F. aircraft. A Vulcan of No. 230 O.C.U. flew from Waddington to Akrotiri, Cyprus, in 3 hr 41 min on July 27. Captained by F/L. R. M. Crawford, it had an average speed of 643 m.p.h. for the 2,365-mile flight. On July 9 a Valiant of No. 214 Sqn., captained by W/C. M. J. Beetham, flew from London to Cape Town in 11 hr 28 min. It was refuelled over the Sahara by Valiants of the same squadron and covered the 6,060 miles non-stop at an average speed of 530 m.p.h.

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For the first time in its history, Southampton U.A.S. this year won the Hack Trophy, awarded annually to the most proficient university air squadron. At Little Rissington on July 2 the squadron first won the Cooper Trophy (competing against Oxford, Cambridge, London and Bristol) then went on to beat Liverpool, Durham and St. Andrews, the other regional winners. This was the first time the competition had been held on this basis, with contests for local trophies deciding the finalists in the main event. The Southampton squadron, commanded by S/L. A. A. Pearce, was represented by A. P/O. R. J. Hale, Cdt. Plt. J. W. Powell and Cdt. Plt. P. A. Sedgwick.

AIR COMMERCE

MOMENTOUS WORDS—1

ONE of the biggest sticks which can be waved at I.A.T.A. by the British Government is the threat to fix its own fares on overseas cabotage routes. If fares to, say, Hong Kong or Nairobi were fixed at levels lower than those prescribed by I.A.T.A., by a Ministry which has powers so to do, the international fare structure could—to use a familiar phrase—be seriously undermined.

Hitherto there has never been any official suggestion that Britain should rock the I.A.T.A. boat by exercising its rights to fix fares on colonial cabotage routes. (A comment on the possibility appeared in *Flight*, May 22, page 721.) However, I.A.T.A. has now been reminded by the Minister of Transport that these rights can be exercised—and will if necessary be exercised. (In the Minister's mind, no doubt, are the independents' "V.L.F." applications.)

Speaking at the annual luncheon of the Air Registration Board at Claridges in July, Mr. Harold Watkinson said: "It is with the Government's full support that British airlines at I.A.T.A. in September will press very strongly for the adoption of economy class fares throughout the world airline structure. I hope that I.A.T.A. will agree to these fare reductions. It is the Government's view that we should achieve them in an orderly way through I.A.T.A. But I must make it plain that if our wishes are frustrated in this body we should then have to consider anew what we might do within the areas which are still under our own control, and I do not rule out some moves on the cabotage front if we fail to get material reductions through I.A.T.A."

MOMENTOUS WORDS—2

ON the same occasion the Minister repeated, with just that much more emphasis, what he had said at the B.I.A.T.A. dinner at the Dorchester last November (see "The Minister Drops a Hint," *Flight*, November 21, 1958):—

"At home, as I have said before, my thoughts are turning very much to the concept of a freer pattern of air transport. This, I think, would be best achieved by the concept of a new, more independent licensing authority. This, of course, would need legislation and no doubt changes in existing legislation. It is, therefore, a matter for the next Parliament."

The future rôle of the A.T.A.C. to which the Minister was indirectly referring, is discussed in a leading article.

THE SOUTHALL ACCIDENT

THE report by the Commissioner of the Public Inquiry into the accident to Viking G-AIJE at Southall on September 2, 1958, was published early in July. The criticisms the report contained were probably the harshest that have ever been raised in connection with an accident to a British aircraft, and have since been widely discussed in the House of Commons and elsewhere. In particular, in the half-day debate on Civil Aviation in the House on July 20, more time was devoted to a discussion of various aspects of the report and its recommendations—including a spirited defence of the then managing director of Independent Air Travel, Capt. Kozubski—than to debating the report of the Select Committee on Nationalized Industries.

In view of the gravity of this report, its implications, and the changes to British air transport that may accrue from its discussion, we shall shortly be reviewing both report and discussion at greater length than is possible in this first issue of *Flight* after the break in publication caused by the printing dispute.

A SMALLER D.H.121

IN these columns seven months ago, on January 23, 1959 (page 143), we referred to "a subtle change of emphasis in the definition of the D.H.121," having previously reported the views of Mr. B. S. Shenstone, B.E.A.'s chief engineer, on the optimum kind of short-range jet airliner. In "Subsonic Setback?" (*Flight*, May 29) the arguments were aired for a smaller new-look D.H.121. And for many months Bristol have been urging upon B.E.A. and others, in the shape of the Bristol 205 project, a much smaller design of jet airliner. It is now reported that B.E.A. and Airco have decided on a smaller D.H.121.

At the S.B.A.C. Display in September last year, the Airco companies (de Havilland, Hunting and Fairey) were talking in terms of an airliner weighing nearly 123,000 lb, with a maximum seating capacity (six-abreast economy class) of 111. For longer ranges than those specified by B.E.A. (a maximum of 1,000 statute miles) maximum weight could be increased to 140,000-150,000 lb.

The capacity of a fleet of 24 such big jet airliners was such as to indicate that, even assuming very large annual increases of traffic, and the disposal of all the Corporation's Viscounts, B.E.A. would not be able to justify the large capacity of the fleets which it had on order (*Flight*, February 28, 1958).

The smaller, 70-80 passenger D.H.121 now proposed would have three advantages: (1) It will permit B.E.A. to exploit its turboprop equipment more fully than would otherwise have been the case; (2) It will provide the Corporation with a jet of smaller unit traffic capacity, thus allowing much more flexibility as to frequency, a commodity still lacking in European operations. (3) It will provide de Havilland and its partners in Airco with a much more marketable product for export in competition with the comparable DC-9. (The larger D.H.121, now abandoned, would have been competing with the Convair 880 and the Boeing 720 some four years after deliveries of these aircraft.)

The Daily Telegraph reports that de Havilland have spent £800,000 on D.H.121 work to date, and that the question of reparations is causing "considerable embarrassment." How this cost will be recovered remains to be seen; it is, of course, likely that the price of the D.H.121 (£1.05m per aircraft originally) will be reduced with its size.

The problem, probably by now resolved, is whether to employ two RB.141s (incidentally allowing a design for conversion, for export airlines which might want it, to four engines) or whether to employ three engines of lower power, such as would be offered by the still-unofficial Rolls-Royce RB.140—or yet another engine—of 8,000 lb thrust. It has been reported that Rolls-Royce are seeking a Ministry contract for the development of the RB.140 for the D.H.121, suggesting that the three-engined formula still stands.

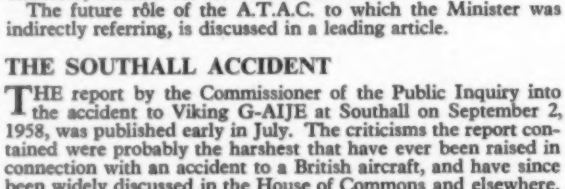
The original programme for the D.H.121, showing the dates due for progress payments (and indicating that the contract was to have been signed as long ago as November, 1958) was given as Appendix 4 to the recent Select Committee's report on the Air Corporations. Price was assumed at £1.05m per aircraft, the sixteenth progress payment (ten per cent) being due for payment "with aircraft complete to engine test" on June 30, 1961. In the Commons on July 6, the Minister of Supply, answering questions about the change in the D.H.121 specification, said that the first flight was now expected in late 1961, with deliveries in the autumn of 1963. This programme still accords with the dates suggested by a chart in B.E.A.'s 1957-58 annual report commented on in *Flight* for January 23, page 143.

FIRST ORDERS FOR CIVIL HERCULES

PAN AMERICAN and Slick have both placed orders for Lockheed GL-207 Super Hercules freighters. Slick, the U.S. domestic cargo carrier, has placed an initial order for six, worth about £7.8m (they anticipate an eventual increase of their fleet to include 11 Super Hercules), and PanAm for 12 at a total cost of £22m. Both airlines hope to put the aircraft into operation in 1962.

The commercial version of the U.S.A.F. Hercules freighter has been on offer to the airlines for "early delivery" since May this year, and these orders—together with those from Flying Tiger and Seaboard and Western for CL-44s—are evidence of growing confidence in the expansion of air freight business. The Super Hercules has a payload capacity of 77,000 lb, considerably in excess of any other type on offer for commercial use. Provided this great capacity can be filled (the aircraft itself has an all-up weight of 230,000 lb and a cargo volume of 7,500 cu ft) low freight rates and a direct operating cost of less than four cents per ton-mile should be possible.

Power for the Super Hercules will be provided by four Allison Model 550s, a turboprop in the 5,000 s.h.p. class now being developed under U.S. Air Force contract as the T61. The order was announced on July 21.



U.K. delegates to the 12th I.C.A.O. Assembly at San Diego last month (to be reported in a later issue) were l. to r.: A. W. G. Kean, delegate; G/C. J. B. Veal, delegate; A. H. Watson, delegate; J. H. Riddoch, alternate chief delegate; M. M. V. Custance, chief delegate

AIR COMMERCE . . .

CORPORATION REVELATIONS

Parliamentary Committee's Fact-Finding Document

HERE is a review of the Select Committee's report on B.O.A.C. and B.E.A., issued in July.* It is without doubt the most revealing inquiry into the Air Corporations yet published. Chairman of the committee was Sir Toby Low, M.P. for Blackpool North. A leading article appears on the first page of this issue.

PART ONE of the report discusses the general position of the Corporations. Among the significant points made are: "However rigid the negotiating procedure [with the trade unions] may have become, it is the responsibility of the management of B.O.A.C. to achieve at a very early date a drastic improvement in the productivity of their aircraft maintenance departments."

It appears that the word "rigid," as used earlier in a similar context, was chosen only after careful consideration (page IXXIII), some members of the committee having preferred the word "complex." This little exercise in semantics illuminates the delicate relationship between the Corporations' managements and the trade unions. The committee took no evidence from the unions; to do so, they felt, would have been "outside their proper sphere of action." This may be judged surprising in view of the evidence of B.E.A.'s chief engineer that improvements in Corporation efficiency (one of the committee's main concerns) are, "in a nutshell, far less a technical problem than a trade union problem."

The heavy loss in 1957-58 on B.O.A.C.'s associated and subsidiary companies is noted. The evidence of Sir George Cribbett (deputy chairman of B.O.A.C.) on this point (para. 2394 *et seq*) is disquieting. He lists the main losses (approximate) as follows: M.E.A., £900,000; B.W.I.A., £700,000; Kuwait Airways, £150,000; Bahamas Airways, £100,000. This represents a total loss, for the first full year of B.O.A.C. Associated Companies Ltd. (September 1957-September 1958) of nearly £2m.

The big loss on M.E.A. (in which B.O.A.C. have invested £6m) caused the Minister to say in the Commons debate on the report: "I regard the situation as extremely grave"; and in evidence to the committee Sir George said that if heavy losses continued "we should certainly have to reconsider our policy as to whether we should go on with participating in this company." The report considers it unwise to try to view the results of subsidiary and associated companies purely in terms of profit and loss, because indirect benefits (feeder traffic, commercial rights, etc.) are advantages. In the case of M.E.A., Sir George says in evidence: "These Arab countries are tending more and more to make it difficult for us . . . to acquire traffic rights, and if we can act through the medium of . . . a local airline we can preserve these rights."

It is the report's opinion that B.E.A.'s annual accounts "are not at present a true indication of the Corporation's efficiency." This is because the losses being sustained on domestic social services, for which a subsidy has been asked but refused, are not published. Notes the report: "The subsidy is being paid not openly through the Civil Estimates, but quietly through the accounts of a nationalized industry. . . . B.E.A. would be wise to insist on placing the responsibility for these losses firmly where they belong." The economic and social ethics of the losses made on Highlands and Islands routes are examined in detail. The committee's above recommendation is strong in view of the good case against subsidy put forward by Mr. M. M. V. Custance of the M.T.C.A. (para. 1978; and appendix 19).

B.O.A.C.'s "Inadequate" Depreciation

The report notes that B.O.A.C.'s financial results achieved in past years "are not as good as they seemed," because the Corporation have not put aside adequate sums for depreciation. B.O.A.C. themselves, in evidence, recognize this. B.E.A., on the other hand, consider that their rate of depreciation, based on the same formula as that of B.O.A.C. (seven years plus 25 per cent residual value), has been adequate.

On depreciation policy in general, the report states unequivocally: "If the airlines of the world embark too early on a race to equip themselves with supersonic aircraft, the current rates of depreciation will be quite inadequate for both Corporations." Typical of the remarks made in evidence by the two chairmen is this from B.O.A.C.'s Sir Gerard d'Erlanger:—

"Technically it does not look as though there is any end to the story, and the only thing that will bring sense to it is an economic appreciation by all the countries of the world that this just cannot go on indefinitely. But whether it is possible to get all the countries of the world to come to their senses, particularly those that have got perhaps a surplus of productive capacity which they want to employ, I just do not know. From the airline operators' point of view it is a nightmare, there is no stability."

Both chairmen independently testify that supersonic transports will undoubtedly increase the level of operating costs.

The report believes that some economies could result from closer co-operation between the two Corporations. The committee would like to think that "this whole question of co-operation is being considered anew." A great deal of evidence is taken on this point. The committee could have emphasized the need for more co-operation very much more strongly. Appendix 40, jointly prepared by B.O.A.C. and B.E.A., listing the extent of co-operation, is a revelation: two British airlines with main bases within a few minutes' walk of each other at London Airport operate no joint technical or operational services whatsoever. Another revelation in this context (not mentioned in the report) is contained in Sir Gerard's annex 3 to appendix 40. So much do B.O.A.C. and B.E.A. overlap in Europe that B.O.A.C. pay a commission to B.E.A. on traffic between European points.

On the score of operations, appendices A and B (pages LX-LXIII), prepared by the M.T.C.A., compare the Corporations' results with those of Swissair, S.A.S., K.L.M., Air France, PanAm, T.W.A., and Sabena (a comparison which, though heavily qualified by the M.T.C.A., was the object of a "spirited attack" by Lord Douglas). From these data, and from extensive evidence by the Corporations, the report concludes that, though B.E.A.'s utilization and costs per c.t.m. are higher than most of their foreign competitors, the Corporation's position as "the only purely short-haul airline of comparable size in the world" make B.E.A.'s results quite creditable, though "if B.E.A. are to improve their cost per c.t.m., it must be met by improving either aircrew utilization or aircraft utilization or both."

Utilization Or Load Factor?

B.O.A.C.'s utilization "has not been good in recent years" though steps now being taken should improve results. The report considers that B.O.A.C. should publish figures for utilization in the annual report, "so that the improvement can be watched." Sir Gerard says in evidence: "We may find it best to increase utilization at the risk of a lower load-factor," and the report suggests that B.O.A.C. have "laid too much emphasis on load factors and not enough on utilization."

It surprises the committee that the major investigation by B.O.A.C. into their excessive engineering costs should not have begun until mid-1957, although the situation was believed by them to have been unhealthy as long ago as 1952. As a result of all measures taken, including the re-organization of the structure of the engineering department, considerably better results had been achieved. But the extent of B.O.A.C.'s inefficiency is apparent from the evidence—frankly stated—of the two main B.O.A.C. witnesses, Sir Gerard d'Erlanger and Mr. Basil Smallpeice. The report notes:—

"B.O.A.C.'s aircraft maintenance costs were [in December 1957] nearly twice those of PanAm. In their engineering workshops B.O.A.C. were employing 3,000 more staff than they needed. They employed more than twice as many staff per aircraft or per flying-hour as did the other airlines investigated, and between four and six times as many inspectors. In all these assessments, there were no compensating factors —such as better workshop equipment—which could account in any significant way for the disparity that had been revealed."

There is some discrepancy between B.O.A.C. and A.R.B. evidence (Mr. R. E. Hardingham of the A.R.B. withstands a searching examination most impressively) as to the responsibility of the A.R.B. for B.O.A.C.'s excessive inspectorate. Mr. Smallpeice thinks that the A.R.B.'s requirements account for a "substantial" part of the additional inspectorate; Mr. Hardingham says "Definitely not." The committee goes into the whole problem of delegating responsibility to the licensed engineer, and sums up:—

"B.O.A.C. have been using a method of quality control which is now out of date; an indication of the scope of the changes they must make is given by their target of reducing their inspectorate to a third of its present size. This will be done by giving the mechanic more responsibility; he will himself see that the job is completed satisfactorily, and there will not be the need for the amount of inspection and control that is at present customary. As a result of this change, there is bound to be a considerable reduction in the responsibilities of the present inspectors and supervisors; this will not in any way run counter to the requirements of the Air Registration Board, but it will rightly engage the interest of the trade unions involved."

Relations between Ministry and Corporations are examined at length. The Committee asks "if the extent of the Minister's non-statutory powers do not add up to a degree of control far in excess of that envisaged by the statutes under which B.E.A. and B.O.A.C.

*"*Report from the Select Committee on Nationalized Industries (Report and Accounts): The Air Corporations*" (*Together with the Proceedings of the Committee, Minutes of Evidence and Appendices*). *H.M. Stationery Office, London. Price 20s.*

AIR COMMERCE . . .

Corporation Revelations . . .

were created, and so lead to an undesirable diminution in the authority of the chairmen . . . and in their feeling of responsibility." It was this section of the report which received most prominence in the newspapers. We comment on it in our leading article this week. The Minister's non-statutory, or unofficial, powers are summarized as applying to the following fields: capital investment; the opening of new routes; operation of routes for national policy reasons; fares and rates; and chartering.

Part two of the report notes that the cost of new aircraft and spares is more than 80 per cent of the Corporations' capital investment. As is shown by the evidence (which was being taken when the D.H.121 controversy was fresh in everyone's mind), the committee spent some time in discovering how the choice was made. A surprising point here, noted in Government and Treasury statements of policy in the evidence and the appendices, is that "no special weight need be given to export potentialities." In general, "the best aircraft from the Corporations' point of view will prove to be the best for export."

The responsibilities of the Transport Aircraft Requirements Committee are investigated. The T.A.R.C., "as the reservoir of research information, and co-ordinating the views of operators, manufacturers and government departments, can offer valuable advice when a Corporation is contemplating an order for new aircraft. With their wide experience, they should also be able to anticipate the needs of the future." The report says that complaints had been made about the "lethargic working of this committee." It is argued by the Ministry of Supply witness that any member of the T.A.R.C. could have convened a meeting if he had thought that it would have been helpful. But past enthusiasm for the committee has been "little more than lukewarm." The report draws attention to the important rôle that it plays.

Much evidence was taken on the controversy which led to the order for the D.H.121, causing a delay estimated by Lord Douglas at six months. B.E.A.'s chairman did not consider the Government's "interference" in the 121 unjustified, in view of the issues involved ("we are," he said, "playing with the taxpayers' money"). So far as B.E.A. were concerned "de Havilland were the best firm to do the job." He furthermore revealed that de Havilland, seeking Government finance to start with, were in the end prepared to build the 121 as a private venture alone—i.e., without Hunting and Fairey and the Airco consortium. It is apparent also that, as recently as March 19 (the last day on which evidence was taken from Lord Douglas and Mr. Milward), B.E.A. had no doubts about the size of the D.H.121 (see the note on page 26 of this issue).

Teething Troubles

On the score of the Britannia's teething troubles, it is disclosed for the first time that B.O.A.C. had to scrap about 300 relays in the electrical system at a cost of £25,000 per aircraft, after nearly two years of service. The bag tanks "went bad," and there had been an "epidemic" of undercarriage torque-link failures.

The Viscount was not without its troubles either: after six years B.E.A. spent about £300,000 putting new main spars into the early Viscounts.

The report considers that the cost of introducing new aircraft into service falls too heavily on the Corporations and "places them at a disadvantage compared with their foreign competitors." (An annex to appendix 9, submitted by B.O.A.C., lists pre-operational training and development costs for the Britannia, DC-7C and the Comet 4. It is a pity that the evidence perpetuates the unworthy fallacy that "American airline operators have the advantage of having had development flying done for them by the Services." This is partly true of the Boeing 707, of which the U.S.A.F. ordered the KC-135 version. It is not true of the Douglas DC-8, the Convair 880 or the Lockheed Electra.

The Corporations' fares policies are reviewed in detail, and the I.A.T.A. machinery is examined. The report says: "Both Corporations were emphatic in their support of I.A.T.A.: without it there would be anarchy." One of the best cases for I.A.T.A. we have read is put forward by Lord Douglas in para. 838.

Much of the evidence given by the Corporations on I.A.T.A. is most revealing, and must surely claim the attention of that Association, which imposes severe fines on members who in its opinion talk too much about what goes on. The report regards as "quite lunatic" the I.A.T.A. unanimity rule—whereby the American transatlantic all-freight airline [Seaboard and Western] once held up agreement on passenger fares.

It is disclosed that B.O.A.C. want higher fares for all classes of service, including economy class, which is at present (say B.O.A.C.) being subsidized by tourist class.

The committee thinks that I.A.T.A.'s advantages outweigh its disadvantages, and notes that it is the policy of the M.T.C.A. to see that no action taken by a British airline should weaken I.A.T.A.

On relationships with the independents (from whom no evidence is taken), the report weighs the strong views of the Corporations and observes: "An arbitrary division of traffic between B.O.A.C. and the independent companies, based on a definite percentage of traffic [e.g., on the African routes, when economy fares are introduced by B.O.A.C.] will hinder the efforts of B.O.A.C. to improve the efficiency of this service and to expand." Otherwise the report is disappointingly non-committal on this highly contentious topic—the crux of the problem as to the future expansion of British air transport.

Rotodyne Situation "Disliked"

B.E.A.'s helicopter operations are examined, and reference made to the Rotodyne. The M.o.S. offer of £4 million for development of this aircraft was wholly dependent on B.E.A.'s contract to buy the aircraft—a situation which Lord Douglas "very much disliked." The contract ("which," said Lord Douglas on March 19, "will be more complicated to draw up than that for the D.H.121") could not be signed for a year.

Of civil air transport in the future, the report notes that both Corporations feel "disquiet." Lord Douglas says in evidence: "I think that the whole of the airline industry has gone a little crazy about jets . . . we cannot afford to be out of the race and I am not sure that we have not all got into the race in too big a way too quickly." Sir Gerard d'Erlanger's similar remarks on this subject have already been recorded.

Commenting on the supersonic era, the report says: "It is still not clear whether an economic design will be produced for a long time: the indications are that such aircraft may prove very expensive to operate." A supersonic race might," concludes the report, "end in the airlines of the world suffering severe financial losses which they will be unable to make good without help from their Governments."

The report does not conclude with a list of specific recommendations. But there are a number of recommendations in the text, the chief of which are summarized below.

- The functioning of the Transport Aircraft Requirements Committee should be watched with the greatest care. Its mistakes of the past should not be allowed to recur.
- Co-operation between the Corporations and the R.A.F. in combining needs could be foreseen earlier.
- If it is considered right for the Minister to fix fares, his power to do so should be made statutory.
- Provision for B.E.A.'s losses on social services should cease to be absorbed in their accounts.
- If a nationalized industry statutorily required to pay its way is to be used as an instrument of foreign policy it should not be required to bear substantial losses as a result.
- A complete review of B.O.A.C.'s policy towards their subsidiaries should urgently be made, and information about their results should be included in all future annual reports.
- Faced with the total extent of the Minister's non-statutory powers, the Committee considers it essential . . . that there should be a clear-cut division of responsibility between the chairmen and the Minister, and that when the Minister wishes to override the commercial judgment of a chairman he should do so by a directive, which should be published.

BOEING BOGIE BOGY

A NUMBER of incidents in July involving undercarriage troubles and resulting in a series of emergency landings, brought maximum publicity—and a Federal Aviation Agency inquiry—to the Boeing 707.

The most serious incident occurred at Idlewild on July 11, when a PanAm 707-120 taking off for London lost the rear pair of wheels from its starboard bogie. After burning-off fuel for four hours, the aircraft landed safely, although not before news of the failure had been widely broadcast and Idlewild Airport and its approaches was thronged with thousands of uncontrolled spectators.

There were also half-a-dozen occasions when the undercarriage had to be lowered by gravity and by cranking it down by hand, implying that both the main hydraulic system and its electrically driven back-up had malfunctioned. Subsequent investigation revealed two sources of trouble: fatigue in the undercarriage bogie beam following—according to *Aviation Week*—failures in the bolts which attach a damper to the beam and to the landing gear strut, and pressure rise in the undercarriage hydraulic system, possibly caused by a choked filter and resulting in pump or seal failure. Recommendations made by the F.A.A. were that landing gear beams were to be inspected every 60 hours and replaced if impact dents larger than 0.005in were found, and that certain hydraulic pumps should be replaced or be fitted with a by-pass valve.

Notwithstanding these troubles with the -120, certification was awarded to the 707-320 on July 15—exactly five years after the first flight of the 707 prototype.

B.E.A. are now preparing for their first new aircraft since Viscounts were introduced in 1953—the long-nosed de Havilland Comet 4B, to be delivered in January, and the Vickers Vanguard, due in March. Here are the first of each type, sporting the Corporation's striking new red-wing colour scheme. (An Olympic Airways order for two Comet 4Bs is announced, and will be discussed in a later issue)

AND NOW THE DC-9

IN June Douglas officially announced, after nearly four years of speculation, a small partner to the big DC-8—the DC-9. It will be powered by the Pratt and Whitney JTF10A-1—turbofan development of the military J52.

The DC-9 is intended for operation in 1963, and it will carry 68 first-class, 87 tourist-class or 92 coach-class passengers. As expected, it closely resembles the DC-8 in general configuration, with the engines mounted in pods beneath the wings. It is intended for short to medium ranges at DC-8 speeds, and it will be released for production when, according to Mr. Donald W. Douglas, Jnr., "we obtain commitments for a reasonable number of aeroplanes" (estimated to be 75-100). Leading data are:—

Powerplant: Four Pratt and Whitney JTF10A-1 turbofan developing 8,200 lb thrust at S.L. and up to I.S.A. +17 deg C.

Dimensions: Span, 94ft; length, 103ft; height, 34ft; wing area, 1,285 sq ft.

Weights: Max. take-off, 120,000 lb; landing, 89,000 lb; zero fuel, 87,000 lb; capacity payload, 17,310 lb; weight-limited payload, 20,355 lb (freight 9,135 lb).

Payload Accommodation: Freight volume, 609 cu ft; cabin length 71ft; max. width, 124in; max. height, 81in; dimensions of largest door, 34in × 72in; max. no. of seats, 92.

Performance: Average cruising speed (471 kt) 554 m.p.h. at 35,000ft and 98,200 lb; balanced field length at 119,330 lb, I.S.A., 5,950ft; landing length from 50ft (max. landing weight), 4,800ft; range (capacity payload) 2,270 st.m.

Break-even passenger load-factors for the first-class version are estimated to be 66 per cent on a 500-mile stage-length and 35 per cent on 1,000 miles.

MORE VISCOUNTS FOR CONTINENTAL?

THE possibility that Continental Air Lines may purchase eight more Viscount 810/840s, and convert the existing fleet of 15 810s to 840 standard, emerges from recent route-applications submitted to the C.A.B., involving new routes between Texas and California. It is likely also, if the applications succeed, that Continental will purchase four Convair 600s.

This is the first allusion for some time to the Viscount 840, which is the faster (Dart RDa.11) development of the 810 (405 m.p.h. instead of 365 m.p.h.). The 810 is still in production, and a total of nine are being built for the shelf.

Another possible Viscount repeat-order is reported from India: I.A.C. has decided, according to a reliable report, to buy four more Viscounts for its new route from New Delhi to Srinagar. A fleet of ten Viscount 768s is already in service.

BREVITIES

On August 7 President Eisenhower approved the C.A.B.'s recommendation, made to him early in June, that B.O.A.C. should be granted the right to include Tokyo in its proposed Hong Kong - San Francisco trans-Pacific round-the-world link. The last *Flight* note on the controversy (which has delayed the B.O.A.C. service by nearly five months) appeared in the June 12 issue, page 804. B.O.A.C. announce that the new service will start on August 22.

Swissair and S.A.S. are likely to change their order for five Convair 880s to Convair 600s (now known as the "Coronado").

The possibility that B.E.A. pilots may work to rule has arisen from a long dispute about pay conditions. The pilots are reported to have been asked whether they would support measures "designed to accelerate" a satisfactory conclusion of wage negotiations.

A United Air Lines team has been to Sud Aviation to study the Caravelle. U.A.L.'s Mr. W. A. Patterson has said that other contenders for a short-range jet order are the DC-9 and the Boeing 727. A decision will be made in June 1960; deadline for delivery would be January 1, 1963.

The Bahamas Air Transport Licensing Authority has approved Eagle's application to operate a "V.L.F." service between London, Bermuda, Nassau and Kingston. The U.K. Government's decision on this and other V.L.F. applications appears unlikely to be announced for some time, probably after the I.A.T.A. traffic conference.

B.O.A.C. services to the continent of South America are to be renewed with Comets on January 25, 1960. Twice-weekly services from London will serve Madrid, Lisbon, Dakar, Recife, Rio de Janeiro, Buenos Aires and Santiago.

Aerolineas Argentinas have been refused Comet 4 landing rights at Rio de Janeiro. According to Reuter, the Brazilian Government has ruled thus because, they say, Comets were damaging the runway. Aerolineas criticize the "poor condition" of Rio's runway, and note that "Comets have been using major world airports for a year without any reports of damage."

Capital Airlines have options on six Electras and six Convair 880s. This has been revealed in C.A.B. hearings on the Southern Transcontinental Service Case. The order would depend, it was said, on negotiations between Capital and "British interests" about the $37 million debt remaining on the airline's Viscounts. Capital placed a provisional order for ten Convair 880s last year; the six 880s now mentioned involve negotiations with Hughes Tool, which has on order 30 Convair 880s for its subsidiary T.W.A., and which is reported to be negotiating the disposal of ten.

I.A.T.A.'s fifteenth annual general meeting is to be held at the Imperial Hotel, Tokyo, between October 12 and 16, 1959. The traffic conference will begin in Honolulu on September 22.

The first of Qantas' seven 707s was delivered to Sydney on July 3. It was flown from San Francisco via Honolulu and Nandi, Fiji. Inaugural San Francisco service was on July 29; extension to London will be on September 5.

Civil Air Transport (C.A.T.) of Teipei, Formosa, have placed an order for one Convair 880 Model 31 Intercontinental, to be delivered in November 1960.

Airborne ILS/VOR equipment has been purchased on behalf of Aeroflot by the Russian Purchasing Authority from Standard Telephones and Cables Ltd. The equipment will be installed in Tu-104As flying the Moscow - London route.

Bristol Aircraft have confirmed details of the proposed civil version of the Type 192 twin Gazelle turbine helicopter, now in production for the R.A.F. Known as the Type 192C it will accommodate 24 passengers, and will be available, certificated, for delivery early in 1961.

An independent review has been ordered by the Minister of Transport and Civil Aviation into representations made by Capt. J. Thain, pilot of the B.E.A. Elizabethan which crashed at Munich in February 1958. The review will be conducted by Mr. E. S. Fay, Q.C., with Prof. A. R. Collar and Capt. R. P. Wigley as assessors.

The new Air Traffic Control Board set up last month by the Minister of Transport will have responsibility for co-ordinating the views of the civil and military A.T.C. authorities. The Board will consist of senior representatives of the M.T.C.A., Air Ministry, Admiralty and M.o.S., and it will be assisted by an Air Traffic Control Executive.

B.E.A. expect that the 1958-59 financial year (for which the Report and Accounts will appear shortly) will show a profit of about £230,000. Profit before charging interest on capital is about £1.3 million. Traffic in June was typical of results so far this year: total l.t.ms. went up 23.6 per cent, equivalent load factor going up nearly 9 decimal points to 68.3 per cent compared with June 1958.

Eagle have sold one of their two Viscount 805s to Maritime Central Airways of Canada, who will operate it from Moncton to Goose Bay and to Gander and St. Johns. Eagle's Bermuda associate will maintain its existing schedules between Bermuda and Nassau and New York, Washington, Baltimore and Montreal with the one Viscount, with DC-6Cs as "standbys." Meanwhile the British Register for August 1959 discloses that Eagle have acquired from Maritime Central a DC-6C, G-APSA, increasing Eagle's DC-6C fleet to three.

Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

Home Tayloring

HOW refreshing it is to see the little Taylor monoplane [p.839, *Flight*, June 19], which has the hall-mark of a winner. I wonder whether John Taylor is aware that in the late 1930s a certain enthusiast named Fred Taylor built his high-wing Wagtail monoplane in the spare bedroom of his municipal house. Like John, Fred's design was also governed by the measurements of a window, through which it passed, first the wings and then the fuselage, to the final assembly barn at Dunton Farm north of Castle Bromwich, Birmingham, from which Fred then taught himself to fly. I saw the Wagtail being built in his bedroom and later saw him fly with the aid of a Douglas flat-twin dirt-track engine.

Birmingham 14. MAURICE AUSTIN.

A Handasyde Revival?

THE death of my father, G. H. Handasyde, occurred on the eve of this Blériot anniversary year, and it may be of interest to your readers who knew him in the industry to learn that in quite recent years we prepared proposals for reviving the name by setting up a new company, Handasyde Aircraft Ltd. Unfortunately the solicitor who was dealing with the matter died suddenly, a year or so before my father. It had been planned to construct an up-to-date small feeder or executive type of aircraft with a speed of about 200 m.p.h., for which my father (like many others) considered there was a wide market.

As you know, "Handy" hailed from Edinburgh, where he designed and constructed his first motor car around 1907, and this might well have been the foundation of a Scottish motor industry, but for the fact that he decided to venture into aviation. After the Second World War he became interested in the possibilities of a Scottish aircraft industry, and it was this that led to the proposal mentioned above.

As one of his last wishes was to see the continuance of his work and pioneer name into the realms of new and (ultimately, perhaps) atomic-powered aviation, I feel that a most fitting memorial or tribute would be the formation of some new aircraft manufacturing organization bearing his name. Possibly there are old or new members of the industry who would be willing to co-operate in an enterprise of this kind.

As a further link between the old and the new eras of aviation, it is interesting (in view of the Blériot Race) that a Martinsyde held the London - Paris record, of 75min, as far back as 1919. This time it was a Hunter, a product of Sir Sydney Camm's design genius; and Camm started his aeronautical career in the Martinsyde works.

I have often wondered if there happens to be an F.4 or similar Martinsyde still in existence. I believe the Spanish Air Force were one of the last to use them and that they were giving good service as late as 1935.

Edinburgh 7. S. H. HANDASYDE.

Signpost Postscript

THE signpost illustrated on Page 822 of your issue for June 19 may draw comment, as what appears on it is not strictly correct. All five of these signposts were replaced with new ones prior to the unveiling of the Atlantic Flight Memorial on June 15. They now read:—

"ALCOCK & BROWN FIRST DIRECT TRANS-ATLANTIC FLIGHT."

Dublin. J. C. KELLY-ROGERS,
Deputy General Manager, Aer Lingus.

Not the First

A STATEMENT in your issue of May 22, reporting Cossor/Bendix Radar co-operation, finishes by saying: "This is stated to be the first time that Bendix have taken a licence from a British manufacturer of electronic equipment."

For the record, we would like to correct this; Bendix Aviation Corporation (Pacific Division) were, in fact, appointed U.S. licencees for the Decca Navigator system on October 27, 1954.

New Malden, Surrey. E. R. BONNER,
The Decca Navigator Co. Ltd.

Contrite Ode

(from a certain oil company to certain engine manufacturers, consequent upon a two-page spread in "Flight" for June 5.)

Proteus changes shape, the Mamba's head's unscathed;
Orpheus sleeps and spurns the Viper's sting;
Olympus now in Sapphire light is bathed.
Round the bowl of Heaven power is on the wing
And Bristol's towers on the Atlantic shore
The strong right arm of Coventry has wreathed about
With Midland smoke. So crave we evermore.
Pardon! As to the name we were in doubt,
But doubt no more.
Vale Bristol; *vale* Armstrong-Siddeley!
Ave Bristol Siddeley!

THE INDUSTRY

Industry Honours

MEMBERS of the aircraft and allied industries named in the Queen's Birthday Honours lists (published on June 13) included the following: Leslie Gamage, chairman and managing director, General Electric Co. Ltd. (Knight Bachelor); G/C. G. R. Scott-Farnie, managing director, International Aeradio Ltd. (C.B.E.); E. C. Wheeldon, managing director, Westland Aircraft Ltd. (C.B.E.); G. R. Bryce, chief test pilot, Vickers-Armstrongs (Aircraft) Ltd. (O.B.E.); J. C. Sharman, manager, research and development, Garringtons Ltd. (O.B.E.); A. B. Bennett, works superintendent, Weapons Division, Fairey Aviation Ltd. (M.B.E.); E. R. Hooper, chief inspector, Saunders-Roe (Anglesey) Ltd. (M.B.E.).

IN BRIEF

Mr. E. J. Nicholl, joint managing director of Dowty Equipment Ltd., has been appointed a director of British Messier Ltd.

Mr. Aubrey Wallace Barr, M.A., a director of Cellon Ltd. since 1955, has been appointed assistant to the managing director.

Mr. Arthur Hillier, O.B.E., chairman and managing director of the Sperry Gyroscope Co. Ltd., retired at the end of July after 43 years with the company, which he joined as assistant secretary.

Brigadier G. L. Fitzgerald has been appointed military adviser to Short Brothers & Harland Ltd. He will be primarily concerned with the SC.5 Britannic project.

Canadair Ltd. have announced the formation of a new "missiles and systems" division. It is to be headed by Mr. Robert D. Richmond, who has been appointed a vice-president of Canadair.

Points from the chairman's review at the a.g.m. of Rolls-Royce Ltd.: to the aircraft industry's £154m export total in 1958, Rolls-Royce engines had contributed £36m; over 2,700 Darts had been built and had flown over 8m hours; Rolls-Royce engines were in service with, or on order for, 66 airlines and 31 other operators; design work on the RB.141 subsonic transport engine reached an advanced stage during 1958, and development work began; and the Spadeadam, Cumberland, site was almost ready for the testing of rocket engines.

Smiths Aviation Division have moved from Cricklewood to Kelvin House, Wembley Park Drive, Wembley, Middx (tel. Wembley 8888).

Edgar Allen & Co. Ltd. announced "with deep regret" the sudden death, early in June, of Mr. L. K. Everitt, one of their directors and general manager of the steel department.

Plannair Ltd. have appointed Mr. J. H. Browne sales executive specializing in air-movement applications for the electronics and aircraft industries; Mr. A. W. Dean succeeds him as contracts manager.

Texas Instruments Ltd. have announced the appointment of Dr. James T. Kendall, M.A. (Cantab.), Ph.D., F.Inst.P., A.R.I.C., A.M.I.E.E., F.R.S.E., as general manager, marketing; he is succeeded as general manager, technical, by Dr. John Powell, B.A., D.Phil.

Thorn Electrical Industries Ltd. have announced that as a result of an agreement between their subsidiary Atlas Lighting Ltd. and Luminator Inc. of America, they have acquired a licence for the manufacture and distribution in this country of Luminator light fittings for transport vehicles, including aircraft.

Air Service Training Ltd.—the aircraft division of which is now incorporated with Hawker Siddeley (Hamble) Ltd.—state that the design and production of their aircraft toilet-servicing units has been handed over to a sister company in the Hawker Siddeley Group, Templewood Hawksley Ltd., of Trading Estate, Slough, Bucks.

Mr. A. K. McLennan has joined de Havilland to supervise the affairs in India of the enterprise and its associates, including the companies of the Saunders-Roe group. Mr. McLennan, who will be responsible to Mr. H. G. Rice, Far East regional manager, has had extensive commercial aviation experience in India following R.A.F. service from 1939 to 1947.

A new company, Cullum Detuners Ltd., has been formed at The Acoustic Centre, 58 Highgate West Hill, London, N.6, to take over the business (silencing and noise control for jet-engine test-beds and aircraft running-up installations) of Detuners Ltd. Mr. D. J. W. Cullum is managing director and Mr. W. E. Camp, formerly general manager, is also a director.

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